

“The Impact of Foreign Aid on Growth and Savings  
in Developing Countries’

by

Ramesh Durbarry, B.Sc., MA.

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# Abstract



# Abstract

Developing countries have received foreign aid and other forms of capital flows for a long time, although they have been subject to some fluctuations. The key question is whether these flows have helped them in achieving their objectives? Aid has been evaluated at two levels: micro and macro. While micro evaluations have found that in most cases aid ‘works’ (for example Cassen *et al.*, 1986), those at the macro-level are ambiguous. This thesis is predominantly concerned with the macroeconomic impact of foreign aid. There have been considerable efforts to improve both the theoretical and empirical literature on aid effectiveness, both suffer from serious weaknesses and shortcomings. At the theoretical level, there are not many models which capture the full potential of foreign aid within a consistent, fully specified, growth framework, while existing empirical studies are flawed by model misspecification, questionable sample composition and size, and inappropriate econometric techniques. This has led to inconclusive and often misleading results in assessing the effectiveness of foreign aid.

This thesis attempts to address some of these deficiencies. The impact of aid is mainly assessed on growth and savings in developing countries. Before testing its impact, aid is introduced into some growth models. Cases are analysed where an economy, after initial aid flows, can become independent of aid and experience sustained growth through its ability to raise labour efficiency. On the empirical front, two techniques are used: a preliminary statistical analysis is performed, followed by an econometric analysis. The former allows a better understanding of the geographical distribution of aid, the link and any correlation between the macro variables: aid, growth, savings and investment. Since aid flows have been influenced by major international shocks (e.g. oil price shocks, debt crises, etc.), a simple taxonomy is used to indicate how these events have influenced the effectiveness of aid. Using a macroeconomic model from Fischer-Easterly to control for the recipients’ macroeconomic

environment (previously overlooked in the literature), a positive and significant impact of foreign aid on growth is found. This result is confirmed using both cross-section and panel data for the period of 1970-1993. We make use of Hall's (1978) life cycle/permanent income hypothesis, but do not find evidence that current aid flows leak into consumption, hence rejecting the fungibility hypothesis. Although much further work concerning the developmental effectiveness of aid remains to be carried out, it is hoped that this study will stimulate improved techniques and methods used in testing the effectiveness of aid in future work.

*To My Beloved and Late Parents*

# Preface

# Preface

Foreign aid is a central sphere of development policy and has probably received as much attention as other field within development economics. Foreign aid predominantly is a product of the post World War II era. Its roots lie in the Marshall Plan which helped to rebuild Europe after the war through an influx of financial capital. Capital (and its productivity) was perceived as the critical factor responsible for growth. The success of the Marshall Plan triggered thoughts in the 1950s of *aiding the emerging nations gaining political independence*, where economic conditions were deplorable. They were heavily dependent on external capital resources for investment and access to global markets for exports. The rationale for aid was seen “principally as a source of capital to sustain and spur economic growth through higher investment” (Browne, 1990, pp. 101). Although it was the United States who took the lead, institutions such as the International Development Association (IDA) and the Development Assistance Committee (DAC) were established to help the management and distribution of foreign aid flows. The question that many (donors, politicians, etc.) are now asking is how effective has foreign aid proved to be in achieving its goal after decades of transfers?

The decision to embark on analysing the effectiveness of foreign aid dates back to my Master’s year at the University of Nottingham where the topic was well covered in the module ‘Aid and Development’ and excellently taught by Dr. Mark McGillivray. I became fascinated by the subject and was more interested when I came across White (1992b) where he stated that “we know surprisingly little about aid’s macroeconomic impact” and went on to point out that “the combination of weak theory with poor econometric methodology makes it difficult to conclude anything about the relationship between aid and savings....[and]...aid and growth” (pp.121). This indeed surprised me because, although the theoretical underpinning might be poor, the proliferation of econometric techniques led me to presume more progress on the empirical

front. These motivated me to perform some empirical testing to find out more about the effectiveness of aid on growth and savings.

The primary objective of foreign aid is to promote economic development and welfare of the developing countries. Controversies exist about the definition of 'development' which make it difficult to explore all of its facets. For instance, Cassen (1988) defines development as "the progress of economies and societies towards improved material conditions and the quality of life of its individuals". Stokke (1996) argues that in the context of foreign aid, "development relates to the economic, social, cultural, political and other objectives identified with the development assistance" (pp. 26). To evaluate the impact of foreign aid is to see whether it has met its objectives. Krueger (1986) suggests that evaluation of foreign aid effectiveness can only be addressed with empirical evidence. Because the indicators of development have more qualitative and normative connotations, it becomes difficult to quantify aid's effectiveness. In view of such discrepancies it has become common practice to evaluate foreign aid's impact on macroeconomic variables such as economic growth, savings, investment and real exchange rates among others.

The present study is mainly concerned with the effectiveness of aid on economic growth and domestic savings. This is not to say that the other macroeconomic variables are not as important, but growth and savings have been, and still are, at the heart of the aid debate. Ambiguous results about the effectiveness of aid emanate not only from poor econometric methodology but also from data measurement error (especially savings data), model specification, sample size and composition, among others. The intention here is to consider the deficiencies of previous studies and improve upon them to further the evidence on aid's effectiveness.

The present study also provides an overview of various growth models and considers in turn the impact of foreign aid. We start from the simple Harrod-

Domar model, followed by the neo-classical model and finally consider endogenous growth models. The empirical exercise which is performed represents an improvement over existing literature in several aspects. First, a preliminary statistical exercise is carried out enabling us to establish any link among aid, growth, savings and investment. Second, careful sample selection is performed. Small countries, defined as population less than one million in 1993, are excluded together with some outliers (e.g. countries receiving aid above 40% of their GDP). Third, concerning omitted variables we are guided by growth theory to control for macroeconomic variables which have previously been overlooked in the aid-growth literature. Fourth, we make use of cross-section as well as panel data for different country groupings. As regards the aid-savings analysis, we make use of the life cycle/permanent income hypothesis to structure our analysis of the impact of aid on savings. This also helps to deal with the problems of measuring domestic savings.

The study, however, is not all encompassing. There are many issues which are not addressed in this thesis due to time and space. One caveat which should be stressed is that aid is treated here as a 'bundle' rather than assessing the impact of bilateral aid versus multilateral aid, or project aid versus programme aid, etc. These can be recommended for future research. We also ignore the motives for giving aid. These are considered elsewhere, for instance in Riddell (1987), Maizels and Nissanke (1984), McGillivray and While (1993), among others. We assume here that donors wish to maximise the recipients' welfare and the motive of giving aid is essentially based on altruism.

A brief outline of the thesis is as follows:

Chapter 1 provides an overview of the aid debate and discusses trends in the volume as well as the composition of capital flows to developing countries over the last two decades. The main international developments, for instance, the two oil price shocks, the debt crisis and the trade liberalisation episodes are

considered and shown to have influenced the distribution and volume of these flows. In Chapter 2 we outline some growth models: Harrod-Domar, Neo-classical and endogenous models. Implicit in some of these models is the assumption that growth is constrained by savings. We then analyse the impact of foreign aid in each and depict situations where growth can be sustained when aid stops. One mechanism of this is where the recipient can accumulate 'knowledge' in association with (temporary) aid flows. In Chapter 3 we briefly discuss the foreign exchange gap as a possible constraint on growth which forms the basis of the dual gap theory. We also provide an exposition of Mckinnon's (1964) and Chenery and Strout's (1966) two gap models. Some critiques of the two gap model are then discussed and alternatives to gap modelling are reviewed.

Chapter 4 deals with some preliminary data analysis. We first analyse the regional distribution of capital flows and then describe the growth performance, savings and investment in those regions. Chapter 5 focuses on establishing a link between aid and growth through a simple taxonomy. We then perform a simple statistical exercise to better understand any possible association between aid, growth, savings and investment.

Chapter 6 critically reviews the aid-growth literature. This enables us to identify weaknesses in previous studies concerning, in particular, sample selection, model specification, data quality and econometric methodology used. Chapter 7 deals with the empirical testing of the aid-growth relationship using regression analysis. We provide details relating to definitions of variables and specify the model to be tested. We include some macroeconomic factors as suggested by Fischer (1993) and Easterly (1993) to control for the recipients' macroeconomic environment (e.g. stability and instability) along with the different sources of capital. We can therefore test for the relative effectiveness of foreign aid in relation to other sources of capital. We use both cross-section and panel data. The former will enable us to cross check our results with



previous studies. In Chapter 8 we test the aid-savings relationship implicitly by further developing the life cycle/permanent income hypothesis. This provides an explicit test of whether foreign aid leaks into consumption which provides some evidence on the important issue of aid fungibility. We also test the effectiveness of foreign aid on investment, based on a simple accelerator model. Chapter 9 provides some final concluding remarks and a summary of the thesis.

# Chapter One

## Introduction

# *Chapter One*

## *INTRODUCTION*

### *1.1 Introductory Remarks.*

The success of the Marshall Plan after World War II opened the door for the developing countries to seek resources from the developed world to boost their economic development and welfare. At this time developing countries were seen to suffer from a chronic shortage of capital and “would develop more rapidly if they could borrow more abroad or find an assortment of fairy godmothers....to bless them with grants and low-interest loans” (Cairncross, 1964, pp. 49).

During the 1950s it was the United States which started to provide some developing countries with capital in the form of foreign aid. The number of donors and institutions has grown over time. It was thought that it would be possible to reduce the widening gap between the developed and developing worlds by allocating aid. Although the motives behind American aid programs at that time were complex and ranged from the selfish to the generous, the same motives are still in place: commercial, political evangelism, strategic, humanitarian and economic. Aid is hence seen as more than an instrument for international relationships, it is a basis for friendship, hope, dynamism, dependence and goodwill.

In this chapter, section 1.2 briefly argues the case for aid, essentially based on moral grounds, while the case on economic grounds is argued in Chapters 2 and 3. Section 1.3 discusses the main trends in the volume and composition of capital flows to developing countries and the distribution of aid. The main international events are traced out since they have a major influence on capital flows. Section 1.4 concludes.

## **1.2 Is there a case for Aid?**

There have been many critics of aid both from the left and the right. Writers on the left (e.g. Jalée (1968), Frank (1969), Hayter (1971, 1981), Wood (1980), Hayter and Watson (1985)) argue that aid is used to further donors own economic interests and to exercise their political power. Aid is seen as part of the process of 'imperialist exploitation', it extends international capitalism which brings poverty. To them, aid is incapable of addressing and alleviating poverty in an effective way. Critics from the right (for e.g. Bauer (1972, 1982, 1984), Bauer and Yamey (1957), Friedman (1958), Krauss (1983)) view aid as politicising the life of the developing world. Bauer and Yamey (1982), in particular, see aid as promoting or exacerbating politicisation of life in aid-receiving countries. Aid, it is argued, extends the power of the state, frustrates the free operation of the market and distorts the price system so that in the end aid impedes the development process. Krauss (1983) suggests that governments' use aid to cover up their mistakes and 'foolish economic policies'. In sum, aid sceptics argue that aid is unproductive and is wasted.

On the other hand, there are many aid supporters who claim that aid should be given for moral reasons. As Chandrasekhar (1965) has put it, although "foreign aid is an economic problem, it may well be a political problem; but it is ultimately a moral problem.....it is a positive factor in the struggle of millions of human beings against the age-old enemies of hunger, poverty, disease, and ignorance" (pp. 53). The Pearson Commission on International Development in 1969 as well as the Brandt Commission (1980) have emphasised the moral and humanitarian motives for providing aid. The prime purpose is not to remove all inequality but to reduce disparities and remove inequalities. The moral case for aid is debated extensively in Riddell (1987). We review here the main arguments. Riddell cites instances where people have been in favour of helping poorer countries on humanitarian grounds. Governments perceive that

they should provide foreign aid because resources have been haphazardly or unequally distributed or that there has been historical exploitation of resources so that there is an 'obligation to act'.

Other instances where governments have a moral obligation to provide aid to the Third World include the degree of poverty and inequality in comparison with the absolute and/or relative wealth in donor countries, the lack of basic necessities to live a human life and to help the developing countries achieve development objectives which are hindered by market forces. The moral case for foreign aid based on 'needs' is justified by the theory of justice. Dower (1983) supports the view along with Streeten (1981), that society has a collective responsibility for meeting 'basic needs' and that the rich have an obligation to help the poor since the rich have resources in excess of their basic requirements. Dower argues strongly for the moral case for aid on the concept of the 'human good'.

Arguments for redistribution have been advanced by utilitarians who claim that the utility of a recipient will be increased more than any disutility to the donors so that in the end total utility increases. Rawls (1973) went further in suggesting that certain basic needs have to be satisfied even if total utility does not increase. He claims that the poorest should receive resources by right, regardless of the effect on the happiness of those whose resources are taken away. His idea arises from principles such as the rules for social justice which are 'formed and legitimised by rational people'. Each person is a self-interested agent who "wants to choose principles which are to govern the society in which he is to live" (in Dower's interpretation) and as Morrissey (1991) explains, "these principles would be those chosen by rational self-interested agents in the original state, that is, behind a 'veil of ignorance' so that they do not know what position they will have in society.....(hence) if potential entrants to society do not know their position in the income distribution or in space (i.e. in which country) they will, a priori, accept that there should be redistribution".

Not many agree with the case for aid on moral or redistributive grounds. Bauer (1981) challenged the moral arguments for aid based on need, egalitarianism and history. For Bauer, economic differences are deserved and 'are largely the result of people's capacities and motivations'. To him, the developing countries are poor because they are lazy and one should not reward laziness through foreign aid. On top of that, Nozick (1974) argues that the state has no right to use its power for the purpose of persuading individuals to help others.

Despite this debate, there are many other reasons why donors give aid to developing countries e.g. for commercial or strategic reasons which are not discussed here. We are mostly concerned with the outcome of transferring foreign aid to the developing countries. We begin by analysing the trends and sources of capital to developing countries since the 1970s. The reason for beginning with 1970 is that the OECD provides a reliable data set from this date and the component of foreign aid can be identified as multilateral, bilateral, grants and technical co-operation.

### **1.3 Capital Flows to Developing Countries: Trends and Sources.**

Developing countries have traditionally been net importers of capital. The international community has been making continuous efforts to supply development finance to meet their insufficient domestic saving or foreign exchange and to match the investment needs to promote growth. The two main sources of supply of capital are official financing, including Official Development Assistance (ODA), and private capital. Capital flows have fluctuated significantly over past decades. These have been associated with the economic environment of capital-surplus countries, the availability and cost of external finance. To analyse the trend of resource transfers, data have been

compiled from the World Debt Tables 1994-95 and the World Bank data which is available on CD-ROM, version 3.0 of the STARS retrieval system (World Bank, 1995). The World Bank takes a developing-country/debtor approach and operates the Debtor Reporting System. World Bank estimates of ODA are based on a combination of OECD measures (donor/creditor approach) and recipient measures for different components of ODA.

The use of foreign capital, private and public, by developing countries has varied substantially across countries and between historical periods. The variation has been both in the aggregate amounts of capital supplied and in the form in which it has been provided. Figure 1.1 and Table 1.1 depict the different types of net resource flows to all developing countries during the period 1970 to 1993. As one can notice, flows of foreign capital to developing countries have been volatile in the past two decades. The aggregate net resource flows have also been deflated by the import value index (1990 = 100) to obtain real values. Figure 1.2 depicts the nominal and real values and it can be seen that they do not differ much. The period 1973-81 witnessed massive capital inflows to many developing countries, largely in the form of private loans. Such lending effectively dried up during the period of the debt crisis, 1982-1987. But in recent years, there has been a surge in net capital flows. This can be explained by the fact that for the first few years after the debt crisis, most lending to developing countries took the form of official loans from international financial institutions to support policy and institutional reforms necessary to achieve stabilisation and adjustment. Once countries began to make progress in their adjustment efforts, private capital inflows towards them increased significantly (Corbo and Hernandez, 1996).

During this period, foreign aid, as a major component of capital inflows, has been rising slowly but its share in total net resource transfers fell during the period 1970-1984 overall, experienced a period of increase during 1985-1987 but fell again thereafter. There are two possible reasons for the decline. First,

**Figure 1.1: Net Resource Flows to All Developing Countries, 1970-1993.**

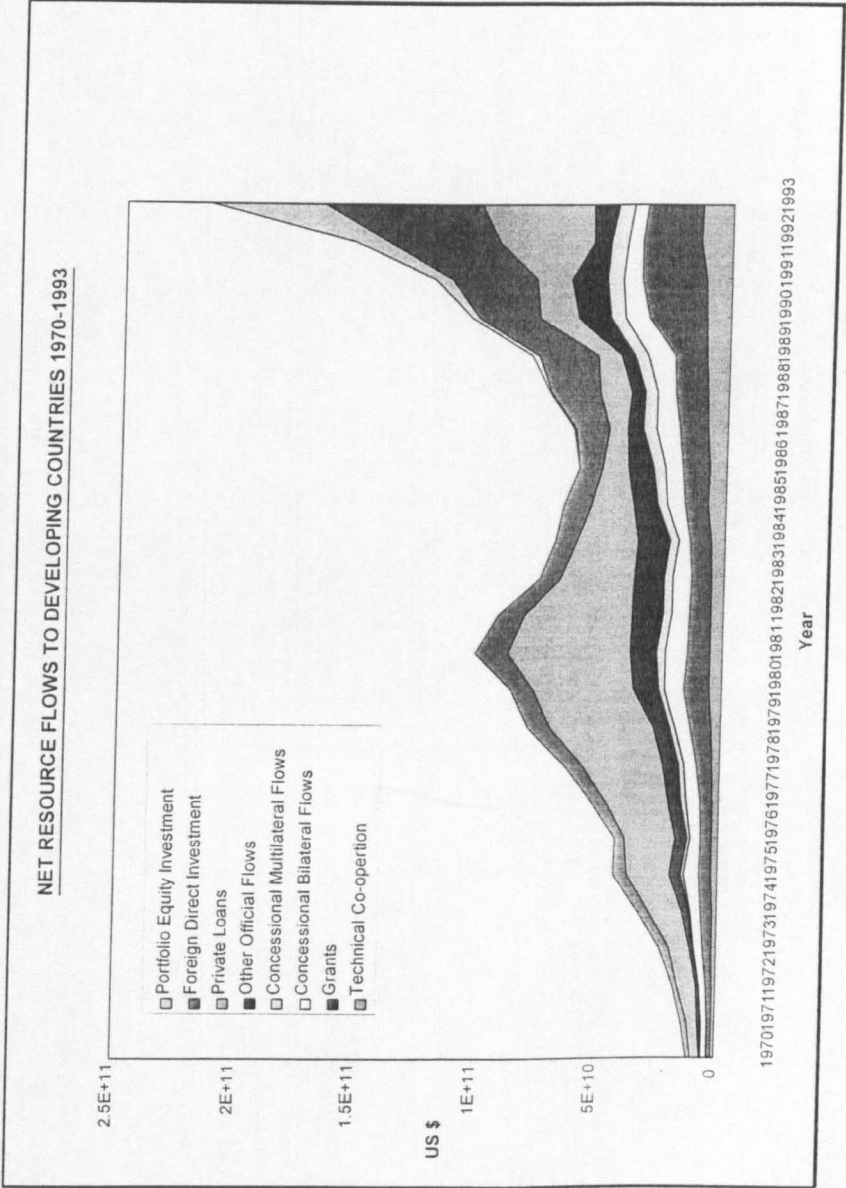
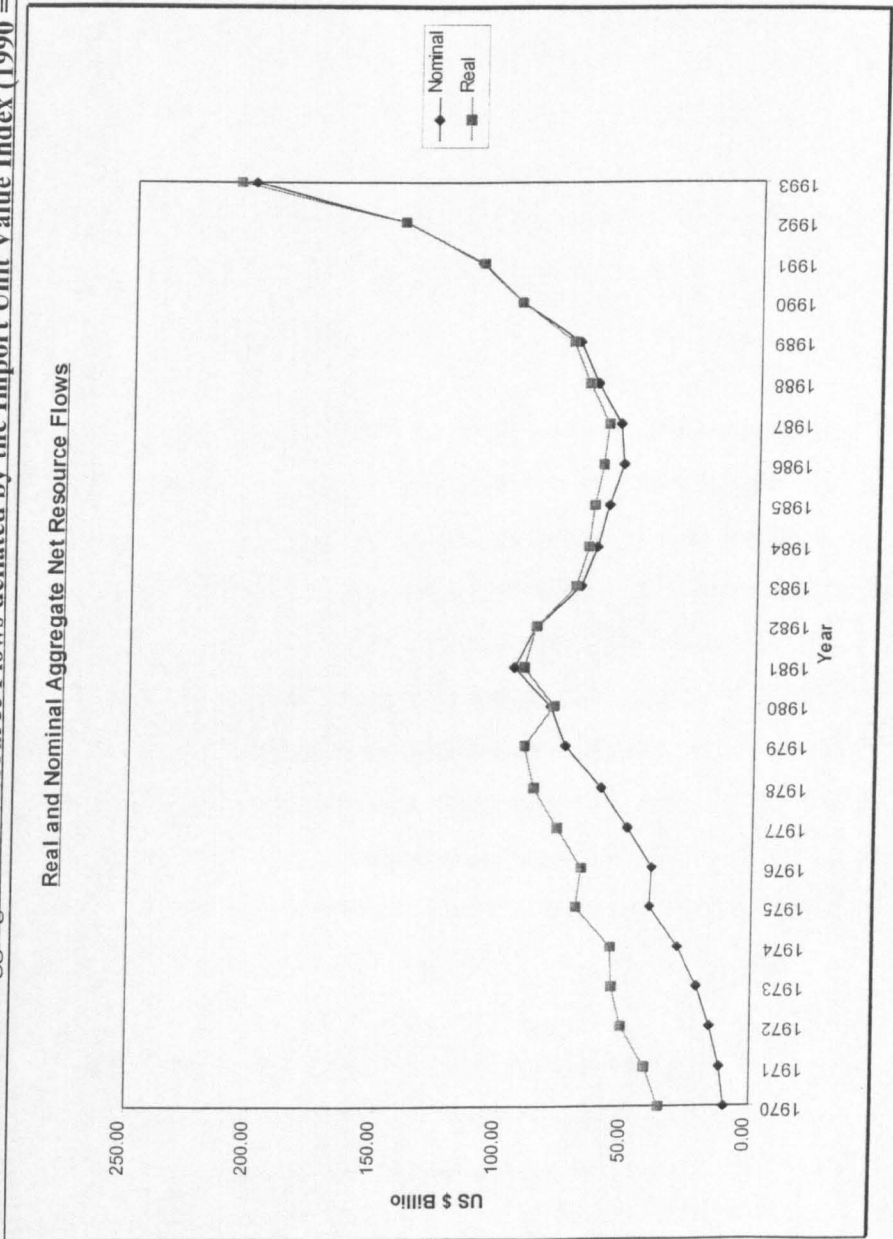




Table 1.1: Net Resource Flows to Developing Countries (1970-1993) US \$ billions.

Category	1970-73	1974-81	1982-87	1988	1989	1990	1991	1992	1993
Aggregate net resource flows	14.77	59.64	65.58	65.20	72.60	96.40	112.00	143.00	203.00
Official Development Finance	6.76	21.67	32.27	31.30	36.10	52.90	55.40	43.90	45.70
Official grants	2.49	7.19	10.01	13.00	13.30	23.80	26.10	24.10	23.30
Official Loans (net)	4.27	14.48	22.27	18.30	22.80	29.10	29.30	19.80	22.40
Total Bilateral Flows	3.05	8.80	10.05	6.75	10.80	13.90	14.70	7.10	7.99
Bilateral--Concessional	2.67	5.97	7.31	7.74	11.77	9.59	8.21	5.98	5.13
--Nonconcessional	0.38	2.83	2.73	-0.99	-0.97	4.31	6.49	1.12	2.86
Total Multilateral Flows	1.22	5.67	12.22	11.60	12.00	15.20	14.50	12.70	14.50
Multilateral--Concessional	0.47	2.06	4.15	5.38	5.34	6.34	6.67	7.31	7.00
--Nonconcessional	0.75	3.61	8.07	6.22	6.66	8.86	7.83	5.39	7.50
Total private flows	8.01	37.97	33.31	33.90	36.50	43.50	56.60	99.10	157.30
Private debt flows	5.37	30.66	22.74	13.15	9.14	15.91	14.60	39.90	45.50
Foreign Direct Investment	2.64	7.29	10.41	20.00	24.70	24.80	35.20	45.50	65.00
Portfolio Equity Investment	-	0.02	0.16	0.75	2.66	2.79	6.80	13.70	46.80
memo									
Technical cooperation grants	1.40	3.16	6.66	12.2	12.2	14.2	15.2	17.8	16.9
Real aggregate net resource flows(constant 1990)	46.49	78.39	69.59	68.78	75.23	96.40	111.55	143.29	209.06
Import unit value index (Base 1990=100)				94.8	96.5	100	100.4	99.8	97.1
Foreign aid (%)	44.18	30.32	40.07	49.51	50.24	48.77	44.17	34.32	23.80
Private Flows (%)	48.69	59.58	44.93	43.80	43.04	39.33	44.50	61.63	71.53

Figure 1.2: Nominal and Real Aggregate Net Resource Flows deflated by the Import Unit Value Index (1990 = 100).



the real volume of foreign aid from donor countries were in fact falling. Second, private capital flows, another major component, had been increasing at a much faster pace than foreign aid. In fact private capital inflows have mostly influenced the total amount of net resource transfers. For instance during the past decade when aggregate net resource transfers peaked at US \$ 126 billion, foreign aid accounted for only 21% while private capital inflows were 51%. But when the world was hit by the debt crisis, private flows to developing countries started to decline, consequently developing countries had to rely mostly on official flows which did not even compensate for the fall in private flows.

It is often claimed that the relatively small share of direct investment and the large share of debt to commercial banks were important reasons for the debt crisis of the 1980s. Compared to official flows, private funding has been especially episodic as one can see from figure 1.1. This has triggered a substantial literature assessing the impact on recipient countries. For example, macroeconomic repercussions such as appreciation of the real exchange rate, expansion of nontradables at the expense of tradables, larger trade deficits, higher inflation, accumulation of foreign reserves, overvaluation and capital flight. Although these are important issues, they are dealt with elsewhere, see for example, Carmichael (1989), Schadler *et al.* (1993), Fernández-Arias and Montiel (1996) and Corbo and Hernandez (1996) among others.

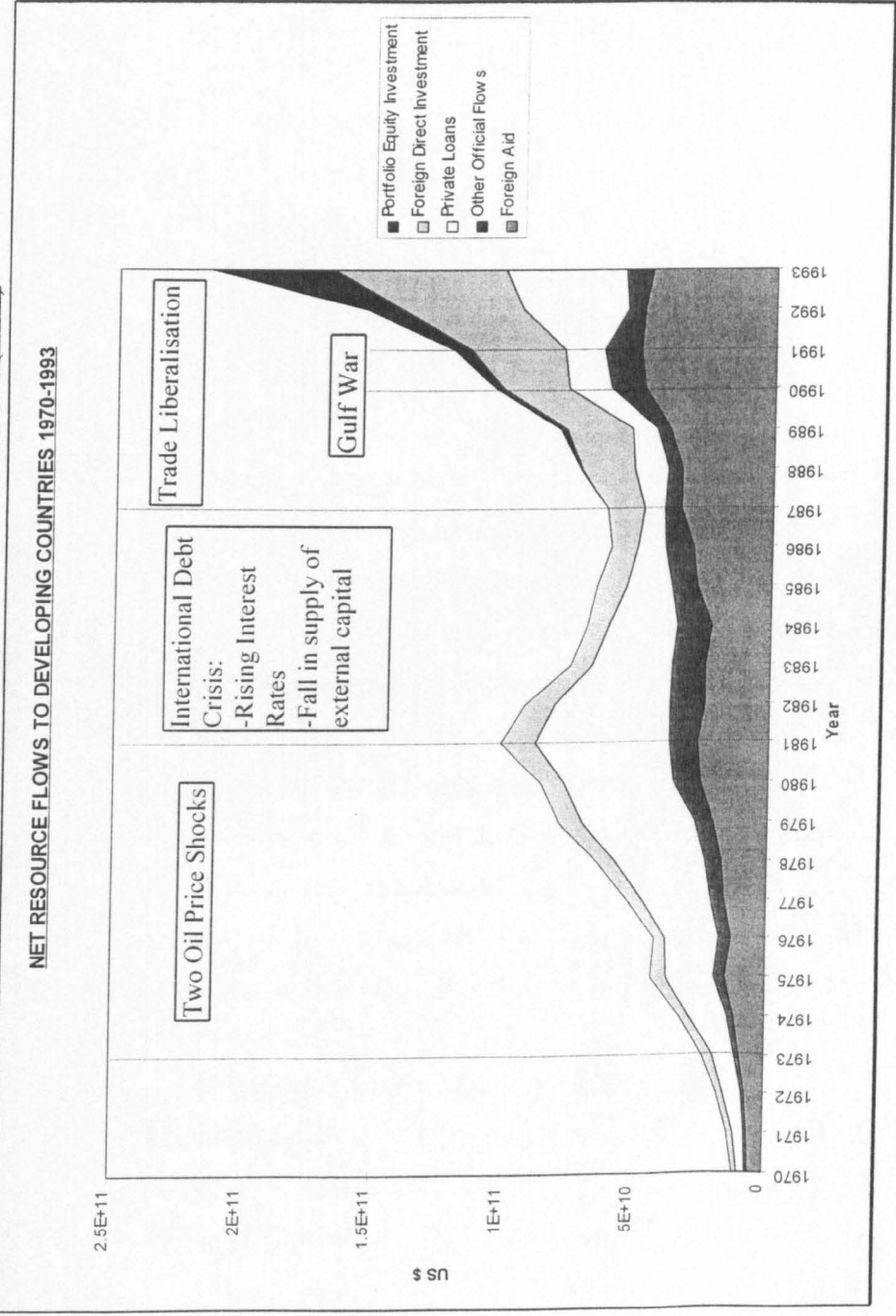
Foreign aid has remained a vital source of financing for developing countries. It is defined as a resource flow “...to developing countries and multilateral institutions *provided by official agencies....administered with the promotion of economic development and welfare of developing countries as its main objective*, and it is concessional in character and contains a *grant element of at least 25 per cent*” (Development Assistance Committee, DAC, 1985, pp. 171, original emphasis). Note that food aid and technical co-operation are also included. The latter covers assistance for developing country individuals

receiving education or training at home or abroad, and for teachers, administrators, technical experts, and the like working in developing countries (Cassen *et al.*, 1986).

Figure 1.3 depicts the main international events that have affected resource flows. During the 1970s there has been a massive flow of capital, both in real and nominal terms to the developing countries largely in the form of private loans (private loans include mainly commercial banks lending, bonds and other creditors). Between 1973 and 1982 the two oil price shocks created a temporary savings surplus in high-income, oil-exporting countries. Their surplus funds were recycled to developing countries. In addition to increasing their development aid, high income, oil-exporting countries placed much of their oil revenue with international commercial banks in the form of short-term Euro dollar deposits. This contributed to raising liquidity in the international banking system because credit demand in the industrial countries had been depressed by the oil price shocks. Liquidity and monetary laxity in the industrial countries drove real interest rates down (World Bank, 1988). As a result it was rather attractive for developing countries to claim more funds for developmental purposes and debt servicing for the cheap loans with few strings attached. Commercial lending to developing countries — along with official lending and aid — grew very rapidly during this period.

The early 1980s recorded a different episode where lending effectively dried up for many developing countries. The period 1982-1987 was characterised by an international debt crisis. A period of very high inflation preceded the second oil price shock of 1982 which was accompanied by anti-inflationary macro-economic policies in industrial countries which led to a rapid rise in nominal interest rates and slowed the pace of economic growth. The combination of increased levels of indebtedness, increased interest charges on variable and new loans, the slowdown in export markets and lower prices for non-oil

Figure 1.3: Aggregate Net Resource Flows to Developing Countries 1970-1993 (US \$)



commodities led to soaring real costs for all forms of new and existing debt. Developing countries with large foreign debts were hit hard. The deterioration of the U.S saving-investment balance caused the United States to stake a bigger claim on the world's savings at a time when savings of the high-income oil exporters was falling along with the price of oil. Rising debt service and the cut in lending led to a reversal of net resource transfers to developing countries during this period.

With the end of the international debt crisis which witnessed a fall in aggregate net resource transfers in both real and nominal terms, there has been a surge in these flows. In fact they started to pick up by 1989, and in 1990 the total net resource flows reached the nominal pre-debt crisis peak level of 1981. This reflected the recovery in advanced countries and the recovering health of the business community. Many developing countries started to receive substantial flows of foreign capital. What is interesting to observe is the composition of the net resource transfers. In fact in the early 1990s, there was a surge in private capital inflows. In 1993 these were US \$159 billion representing 75% of total net resource flows. The surge in private capital flows was accompanied by a shift in their composition toward equity in the form of foreign direct investment and portfolio investment. Together these equity flows accounted for more than two-thirds of private capital flows in 1993. Debt flows have favoured bonds rather than commercial bank loans, with bond issuance accounting for one-quarter of private flows in 1993 (World Bank, 1994).

On the other hand, foreign aid to developing countries which were stable, averaging US \$ 36 billion in the 1980s experienced a sharp increase in 1990 and 1991, reflecting in part higher official grants and lending associated with the Gulf War. Due to capital market imperfections, not all developing countries can rely on, or have benefited from, access to private international capital markets. Private capital flows have favoured mostly middle-income countries leaving the low-income countries to rely heavily on official loans.

The analysis has shed light on the distribution of net resource transfers to developing countries as a whole, but is the scenario just described the same for all? Certainly not. For this purpose the developing countries have been clustered as low and middle income countries; the flows are depicted in figures 1.4 and 1.5 respectively.

From figure 1.4 it can be seen that low income countries have relied heavily on foreign aid. In fact official grants and official loans constituted the major part in net resource transfers in contrast to middle income countries. The low income countries attracted very little private capital during the 1970s and 1980s. During the international debt crisis, foreign aid accounted for the bulk of resource transfers of which grants were even more pronounced. These transfers were mostly directed to finance the cost of existing debt and towards balance of payments support. With the end of the debt crisis, trading opportunities due to the recent negotiations under the GATT agreement and recovery in the industrial nations have motivated private capital flows to become an important major source of external finance. The major component of this source of capital is seen to come from foreign direct investment, which was not so popular, has surged from 14% in 1990 to 47% in 1993 of total net resource transfers and its share in total private capital flows rose from 47% in 1990 to 65% in 1993. Official flows also have shown some sign of increase of which the component of official grants was very important. Most of these grants have been directed by donors towards debt relief for low income and highly indebted countries.

For the middle income countries the scenario has been the other way round. As figure 1.5 demonstrates, for these countries private capital flows have been the major source of external capital. For the 1970s and 1980s foreign aid accounted for only around 35% of total net flows. This proportion fell to around 15% in 1993. The volume of private capital flows to these countries has quadrupled

Figure 1.4: Aggregate Net Resource Flows to Low Income Countries (US \$) 1970-1993.

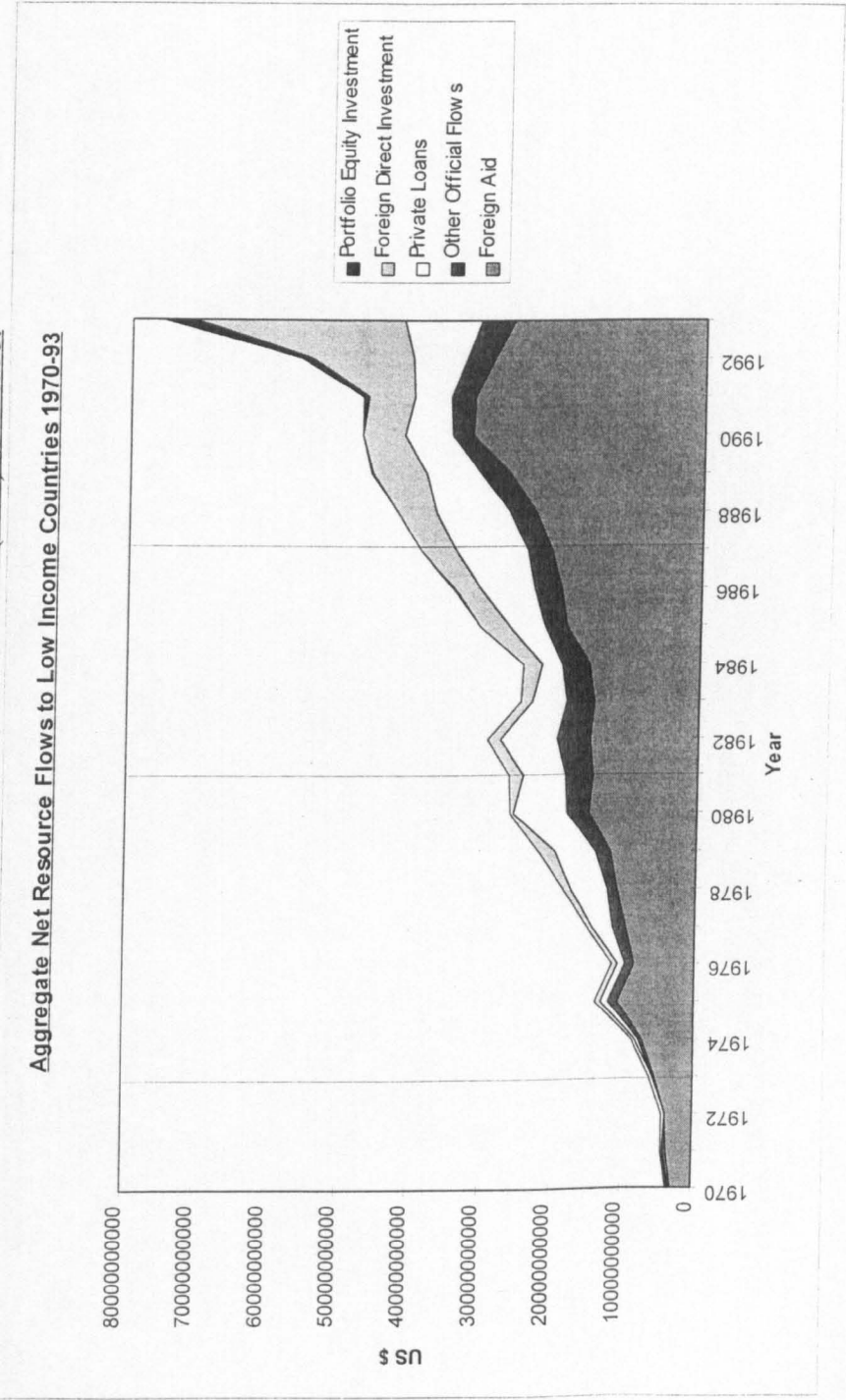
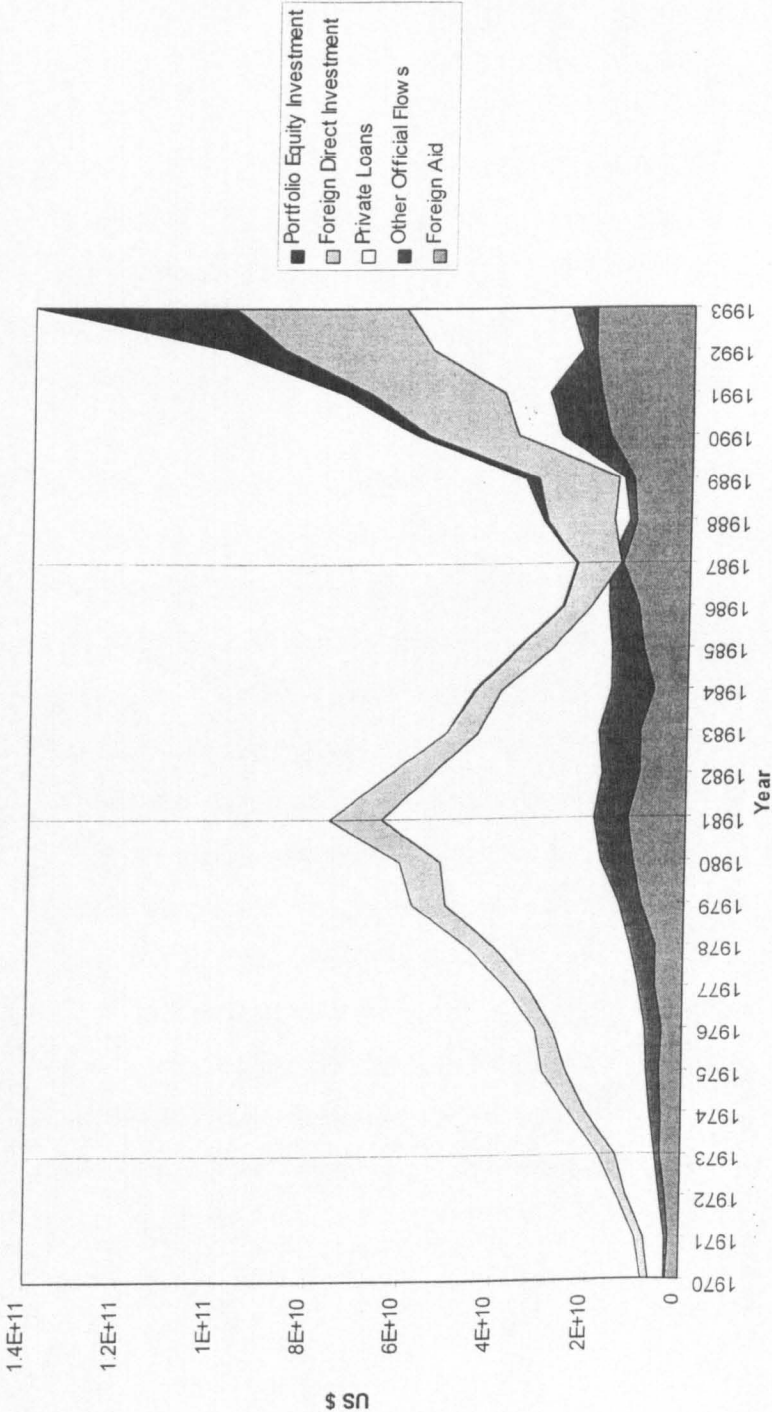




Figure 1.5: Aggregate Net Resource Flows to Middle Income Countries (US \$ billion) 1970-1993.

Aggregate Net Resource Flows to Middle Income Countries 1970-1993



since the turn of this decade. There has been a major increase and shift in the component of private capital flows itself. With the end of the debt crisis, foreign direct investment and portfolio investment have surged spectacularly. With emphasis on trade liberalisation and confidence in the business community along with economic recovery of industrial nations, equity flows seem to favour, to a large extent, the middle income countries. Investment opportunities and incentive packages attract equity flows, but in 1994 the outlook for these flows points to a slowdown. This is due mainly to the combined effect of higher interest rates and a period of turbulence in international bond markets in early 1994.

As noted earlier, although the trend of net resource flows has experienced some fluctuations, foreign aid flows have been relatively stable. Without doubt low income countries have been the major recipients of these flows. In per capita terms, there have been some important regional allocation differences. Table 1.2 and figures 1.6 and 1.7 show the trends and distribution of aid per capita for countries grouped into six main regions. It is no surprise to see that per capita aid in East Asia and the Pacific and South Asia is relatively lower than any other region due to the presence of the two most populated countries in each region, China and India respectively. Although aid per capita has risen over time in each region, it is Europe and Central Asia that has experienced greatest change. In fact with the breaking up of the Soviet bloc and the creation of New Independent States, foreign aid has been an important source of capital transfer, as those countries rebuilt their economic base. In addition Turkey is one of the countries in the region which has been politically favoured by some donors.

Table 1.2: Regional Aid Per Capita US \$ (1970-1993).

Region	1970-73	1974-81	1982-87	1988	1989	1990	1991	1992	1993
East Asia and The Pacific	1.6	1.9	2.9	4.6	7.2	6.5	4.8	5.2	5.3
Europe and Central Asia	6.9	10.3	13.7	22.0	42.0	44.9	40.9	59.0	61.7
Latin America and The Caribbean	2.4	3.7	7.5	9.4	9.9	12.3	15.3	11.7	11.9
Middle East and North Africa	10.4	39.5	37.3	23.8	21.5	44.0	47.1	32.0	23.8
South Asia	2.1	4.3	4.8	5.5	5.5	5.4	6.1	5.4	4.3
Sub-Saharan Africa	5.5	15.6	23.9	31.4	31.9	39.0	35.8	36.6	34.9

Source: Computed from World Bank (1995).

Figure 1.6: Aid per capita (1970-1973)

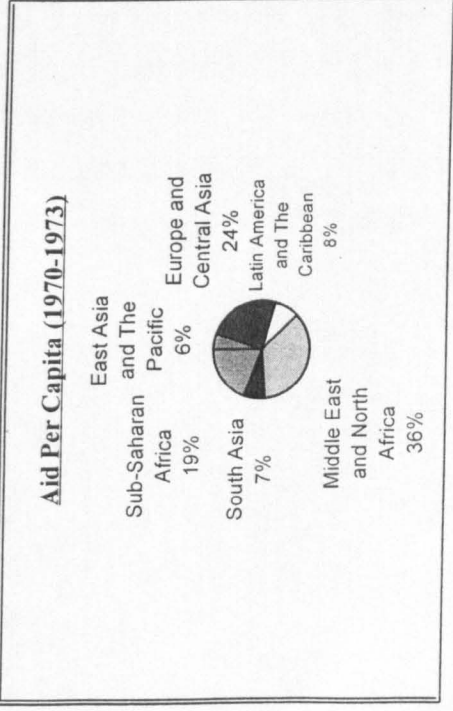
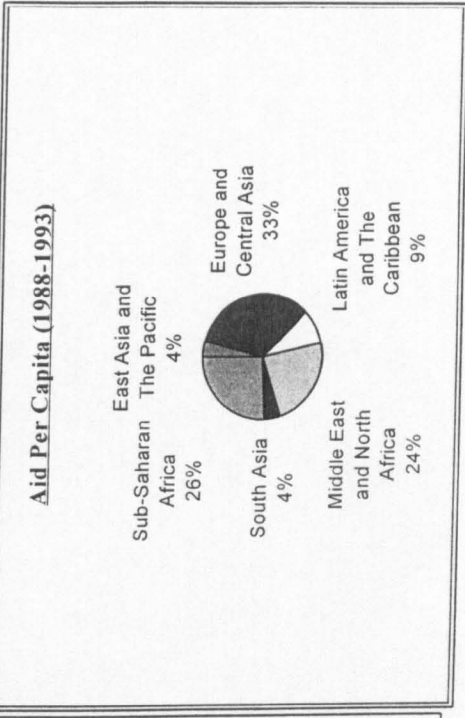


Figure 1.6: Aid per capita (1988-1993)



**1.4 Conclusion**

Foreign aid is controversial. Donors have been giving aid due to different motives: altruism, humanitarian, ties with ex-colonies of a benign nature, military and strategic advantage, commercial benefit, ideology and neocolonialism, among others. We did not explain the motives behind giving aid but were more concerned to evaluate the effectiveness of foreign aid. It has been noticed that the trend of capital transfers to developing countries has been volatile to the major international events that took place between the period 1970-93. Overall, the trends in capital flows have indicated that the composition of aggregate net resource flows to developing countries by income groups has now become a function of access to international capital markets. Countries with market access now rely increasingly on private capital flows, while those without market access depend mainly on official flows. In recent years private capital flows have become an important source of capital finance even for low income countries. Regionally, although Sub-Saharan Africa has been receiving substantial amounts of foreign aid, in per capita terms, countries in Europe and Central Asia have recently received the highest amount. Before evaluating the effectiveness of foreign aid empirically, in the next chapter we incorporate foreign aid into some conventional growth models to assess its potential impact theoretically.

# Chapter Two

## Foreign Aid in Growth Models

# **Chapter Two**

## **FOREIGN AID IN GROWTH MODELS**

### **2.1 Introduction**

The main objective of foreign aid is to promote economic development. As explained earlier, economic development is difficult to quantify as it is concerned with 'a changing system or an evolving structure' (Morrissey, 1991), it has a more qualitative and normative connotation. In the absence of any better quantitative indicator, although some caveats remain, we have argued to use economic growth as a proxy for economic development due to the limitations mentioned in finding data for other indicators.

In this chapter, we try to use some growth models to evaluate the possible impact of foreign aid and to assess its implications. This exercise has not been extensively analysed in the aid literature. We start with the simple Harrod-Domar model of growth in section 2.2, then the Neo-classical growth model developed by Solow (1956) and Swan (1956) in section 2.3 along with some extensions. In section 2.4 an analysis of the 'new' model of endogenous growth is outlined. The impact of foreign aid is considered in each model. We also discuss within the growth models alternative forms of aid, for example, where foreign aid enables the possibility of knowledge spillovers (section 2.5) and finances intermediate inputs imports from the donor (section 2.6). Note that an implicit assumption in these growth models is that the developing countries are assumed to be savings constrained. Section 2.7 summarises and concludes the chapter.

## 2.2 The Harrod-Domar Growth Model.

### 2.2.1 An Overview

The publication of Harrod's seminal paper followed shortly by Domar's similar<sup>1</sup>, but independently derived, provided a stimulus to growth theory (Harrod, 1939; Domar, 1946). The similarities between the central results of the models resulted thereafter in a joint title, the Harrod-Domar model. This approach to economic growth is Keynesian in spirit. It is built on the concepts and methods of Keynesian short-run macroeconomics, it concentrates on the necessary conditions for equilibrium between aggregate savings and investment in a dynamic economy. As with Keynes, they are more interested in *ex ante* than in *ex-post* savings and investment, because savings is necessarily equal to investment *ex-post* through adjustments in income. Hence the Harrod-Domar growth problem is concerned with the maintenance of a steady rate of growth which combines the multiplier with the accelerator principle to determine, not the level of income, but the rate of growth of income that assures continued equality between *ex ante* savings and investment.

The Harrod-Domar model can be outlined with the following assumptions:

1. Savings (S) is some constant proportion,  $s$ , of national income (Y) such that

$$S = sY \quad (2.2.1)$$

2. Investment (I), defined as a change in the capital stock, K, is in accordance with the acceleration principle assumed to be a constant proportion of the rate of growth of output so that,

$$I = \Delta K = \kappa(Y - Y_{-1}) \quad (2.2.2)$$

$$I = \Delta K = \kappa \Delta Y \quad (2.2.3)$$

where  $\kappa$  stands for the marginal technical capital coefficient or simply the incremental capital-output ratio and  $\Delta$  indicates a change in the variable.

Dividing equation (2.2.3) by Y yields:

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<sup>1</sup> Their description contains some similarities and differences which is not of major importance in the present analysis. For a comprehensive exposé see Hywel (1975).

$$\frac{\Delta K}{Y} = \kappa \frac{\Delta Y}{Y} \quad (2.2.4)$$

Rewriting (2.2.4) by substituting  $\Delta K$  for  $I$ ,

$$\frac{I}{Y} = \kappa \frac{\Delta Y}{Y} \quad (2.2.5)$$

Rewriting  $\Delta Y/Y$  as  $g$ , the rate of growth of output can be expressed as

$$g = \frac{1}{\kappa} \frac{I}{Y} \quad (2.2.6)$$

On the assumption that  $\kappa$  is fixed, based on the assumption that the production function is of fixed proportions, the only constraint to growth is investment. Capital, hence, is seen as a bottleneck to growth. This ‘fact’ is also used by Rostow (1956), who argued that investment will bring the momentum for take-off in developing countries by “a rise in the rate of productive investment from (say) 5 per cent or less to over 10 per cent of national income....”.

### **2.2.1 The impact of foreign aid in the Harrod-Domar model.**

On the assumption that *ex ante* savings is equal to *ex ante* investment we can deduce using equations (2.2.1) and (2.2.6) that:

$$g = s/\kappa \quad (2.2.7)$$

Hence the fundamental ‘trick’ of economic growth, as Todaro (1994) calls it, is simply to increase the proportion of national income saved. This would imply that countries which are able to save a higher proportion of income could grow at a much faster rate than those that saved less. Moreover, this growth would then be self-sustaining.

On the basis of the above formulation, a country can fix a target rate of income growth, say  $g^*$ , and hence determine the level of investment required to



achieve that rate. If the domestic savings generated cannot meet the required investment to achieve the targeted growth, then a savings constraint is said to exist. This is a particular feature of most poor developing countries which have a relatively low level of investment due mainly to their inability to generate sufficient domestic savings (e.g. through taxation). It often found that private capital in any single industry in a poor country is unlikely to be financially attractive or successful because of the small size of the market for its products. A reason for less private capital inflows, especially foreign direct investment, would be because of limited opportunities for profit that sustains the level of investment (Cairncross, 1962). Hence, given that domestic savings are low and prospects for private foreign investment bleak, the rationale for foreign aid is justified to substitute for these deficiencies. This would relieve the country from a capital bottleneck. Denoting  $a$  as the proportion of foreign capital inflows in the form of foreign aid to national income, the targeted growth rate will be given by:

$$g^* = (s + a) / \kappa \quad (2.2.8)$$

which will be higher than the growth rate permissible by domestic savings only. Thus, this justifies one of the reasons for massive capital transfers and technical assistance from developed to the developing world due to the capital bottleneck faced by these countries.

Rosenstein-Rodan's (1961) pioneering effort was to use the above procedure to determine the allocation of foreign aid in underdeveloped countries. He calculated the amount of foreign capital transfer in view to reducing the time it takes to achieve 'self-sustaining' growth. To Rosenstein-Rodan foreign aid permits a recipient country 'to make the transition from stagnation to self-sustaining economic growth'. This can only be achieved by the recipient's own effort otherwise foreign aid will be wasted. The main aim of development aid is to enable the recipient country to achieve steady growth. It is worth pointing out that 'economic factors' are a necessary but not a sufficient

condition for sustained growth, other factors—institutional, social and political—are also important.

For ascertaining the length of time for the underdeveloped countries to reach ‘self-sustaining’ growth, it is assumed that there is a divergence between *ex ante* savings and investment. The capital flow requirements of the underdeveloped countries over a certain period in relieving the savings constraint is calculated as follows:

(i) From the Harrod-Domar model

$$I = \kappa \Delta Y \quad (2.2.9)$$

and assuming that the gross national product increases by  $r$  per cent and that the capital-output ratio,  $\kappa$ , to be constant,

$$\Delta Y = rY \quad (2.2.10)$$

Substituting equation (2.2.10) into (2.2.9) yields

$$I_t = \kappa r Y_t$$

where  $t$  is a time subscript. Hence

$$\Sigma I_t = \kappa r \Sigma Y_t \quad (2.2.11)$$

(ii) The savings function is specified as

$$S_t = bY_t - d \quad (2.2.12)$$

so that the marginal propensity to save,  $b$ , is greater than the average propensity to save,  $(b - d/Y_t)$  where  $d$  is a constant. Aggregate savings will be given by:

$$\Sigma S_t = b \Sigma Y_t - \Sigma d \quad (2.2.13)$$

and  $d$  can be determined by putting  $t = 0$ , thus

$$S_0 = bY_0 - d$$

$$\therefore d = (b - S_0/Y_0) Y_0$$

where  $S_0/Y_0$  is the average propensity to save in the initial period. Substituting the value of  $d$  in the savings function we get

$$\Sigma S_t = b \Sigma Y_t - \Sigma d$$

$$\Sigma S_t = b \Sigma Y_t - tY_0 (b - S_0/Y_0) \quad (2.2.14)$$

(iii) At any time  $t$  the amount of foreign capital inflows needed to meet the gap between investment and domestic savings to achieve the targeted growth is given by  $F_t = I_t - S_t$ . Hence the total capital inflow,  $\Sigma F_t$  will be given by

$$\Sigma F_t = \Sigma I_t - \Sigma S_t \quad (2.2.15)$$

substituting for  $\Sigma I_t$  and  $\Sigma S_t$  yields :

$$\begin{aligned} \Sigma F_t &= \kappa r \Sigma Y_t - [b \Sigma Y_t - t Y_0 (b - S_0/Y_0)] \\ \Sigma F_t &= (\kappa r - b) \Sigma Y_t + t Y_0 (b - S_0/Y_0) \end{aligned} \quad (2.2.16)$$

Rosenstein-Rodan argues that recipient countries should make some 'efforts' for a self-sustaining transition. What he is trying to suggest is that recipient countries should, among one of the 'efforts', save more from the increased income arising from 'outside capital', otherwise foreign aid will be wasted. He further argues that:

"A marginal savings rate considerably higher than the average is the main lever of economic development of underdeveloped countries. Once the level of self-sustaining growth is reached, with average savings of 12-15 per cent, the marginal savings rate need no longer be higher than the average." (1961, pp. 117)

The idea is that aid should continue until a certain level of income is reached in the developing countries so that they can mobilise a level of capital formation sufficient for self-sustaining growth. Many writers have misinterpreted this idea by adding that for self-sustaining growth the marginal propensity to save 'should exceed' the average propensity to save. For example, White (1992) and Thirlwall (1994) stated that<sup>2</sup> this transition is achieved if the marginal propensity to save exceeds the average savings rate, so that the latter rises with income. The ratio of foreign capital inflows,  $F_t/Y_t$ , is given by  $I_t/Y_t - S_t/Y_t$  or  $F_t/Y_t = \kappa r - (b - d/Y_t)$ . To achieve self-sustaining growth reliance on foreign capital inflows needs to fall. For this to happen  $b$ , the marginal propensity to

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<sup>2</sup> But Thirlwall soon afterwards stressed that for a country to reduce external borrowing, marginal rate of saving should exceed the required rate of investment.

save, needs to be greater than  $\kappa r$ . But what is  $\kappa r$ ? The above mentioned authors have interpreted  $\kappa r$  as the average propensity to save which is wrong.  $\kappa r$  can only be interpreted as the average propensity to save if and only if  $I_t/Y_t = S_t/Y_t$ . But the very essence of foreign transfers is that  $I_t/Y_t \neq S_t/Y_t$ . So  $\kappa r$  should be defined as the required investment rate to achieve certain targeted growth rate. Hence, for achieving self-sustaining growth the country's marginal propensity to save needs to be higher than the required investment rate.

The implication of the Harrod-Domar model is quite straight forward, foreign aid will enable higher growth as long it is flowing in. Growth will fall back to its previous level once foreign aid is removed, unless the marginal propensity to save matches the required investment rate which it will when the country is in its self-sustaining stage.

### **2.3 The Neo-classical Growth Model.**

#### **2.3.1 An Overview**

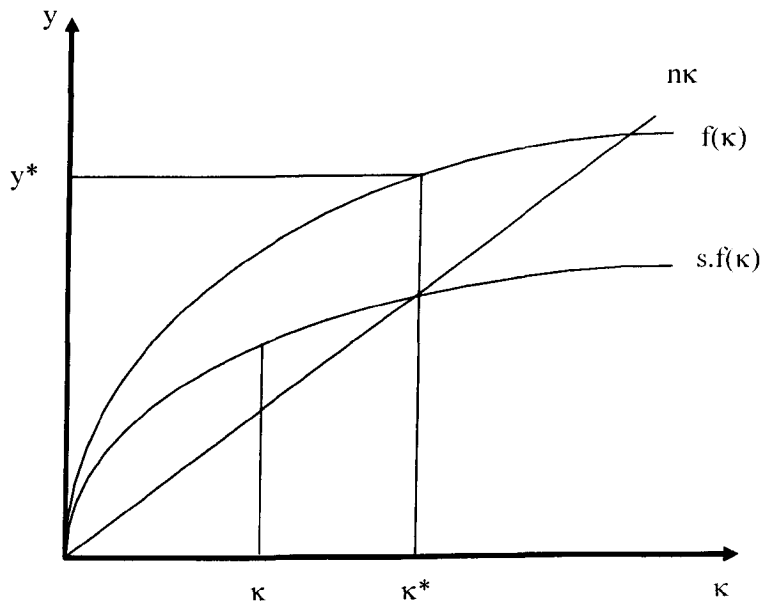
The Harrod-Domar model has provided a framework for evaluating the impact of aid on growth. Many writers see the growth model of Solow (1956) and Swan (1956)-- the so-called neo-classical model of growth as more persuasive. This was developed because in "...the Harrod-Domar version of the parable, the numbers  $s$ ,  $\kappa$  and  $n$  are independently given facts of nature....If  $s$ ,  $\kappa$  and  $n$  are independent constants, then there is no reason at all why it (the steady state of growth) should happen that  $s = \kappa n$ , except by the merest fluke" (Solow, 1970). Solow then argued that at least one of the three numbers must be, not a given constant, but a variable capable of taking on a sufficiently wide range of values. Among these the more plausible candidate was to drop the assumption of fixed-proportion technology in production and to deal with a variable capital-output ratio. An advantage to this approach is that the capital-labour ratio is now endogenous.

The model is set out in Appendix 2.1 showing how an economy reaches a steady-state growth. We then use it to analyse the impact of foreign aid. From Appendix 2.1, the fundamental equation of the neo-classical growth model is given by:

$$\dot{\kappa} = s.f(\kappa) - n\kappa \quad (2.3.9)$$

where  $s.f(\kappa)$  is the saving per worker (and since saving is also equal to investment in this model, it is also regarded as the flow of investment per worker and  $n\kappa$  is the amount that would be required to keep the capital-labour ratio constant (note that the labour force is growing at a constant proportionate rate  $n$ ). The rate of change of the capital-labour ratio,  $\dot{\kappa}$ , is hence determined by the difference between the amount of saving (and investment) per worker and the amount required to keep the capital-labour ratio constant as the labour force grows. Equation (2.3.9) implies that the economy settles in the long run to a steady state. This is illustrated in figure 2.3.1. The lower of the two curves is equal to the intensive production function,  $f(\kappa)$ , scaled down by the factor  $s$ . Since  $0 < s < 1$  and  $f(\kappa)$  is well-behaved,  $s.f(\kappa)$  is everywhere below  $f(\kappa)$  and is also well-behaved.

**Figure 2.3.1: Steady-state in the neo-classical growth model.**



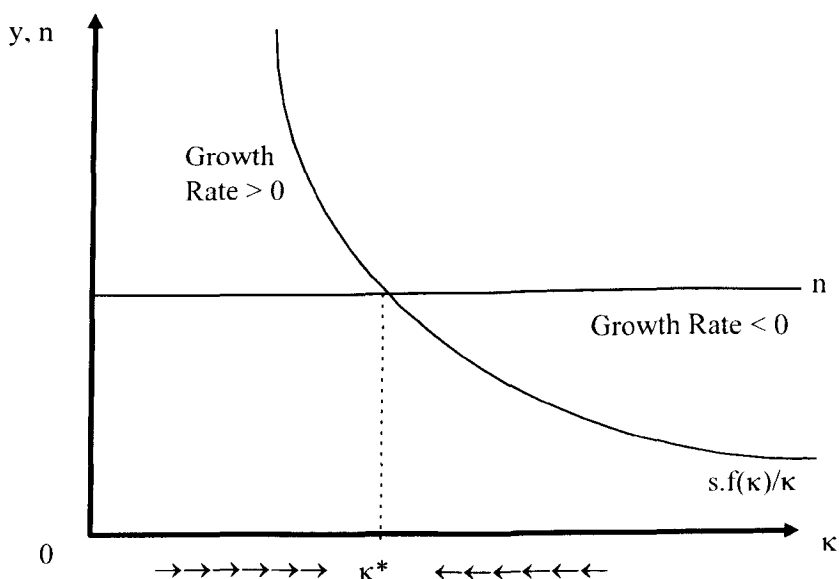
The line through the origin is  $n\kappa$  with slope  $n$ . Steady state growth occurs at  $y^*$  and  $\kappa^*$  where the line  $n\kappa$  intersects the curve  $s.f(\kappa)$ . If the saving per worker is greater than the amount required to keep the capital-labour ratio constant as the labour force grows, e.g. at  $\kappa$ , then it is clear that the capital stock will grow faster than the labour force and the capital-labour ratio will consequently increase. Similarly, if saving per worker is less than  $n\kappa$ , capital-labour ratio will decrease. Hence given the assumptions, a balanced-growth solution for the model exists and is stable, for whatever the initial values of all the variables in the model, the economy moves steadily towards the balanced growth path which is also unique.

Equation (2.3.9) can be rewritten following Barro and Sala-i-Martin (1995) as:

$$\frac{\dot{\kappa}}{\kappa} = \frac{s.f(\kappa)}{\kappa} - n \quad (2.3.10)$$

to illustrate the steady-state. The first term of equation (2.3.10) is a downward sloping curve, which asymptotes to infinity at  $\kappa = 0$  and approaches 0 as  $\kappa$  tends to infinity. The second term is a horizontal line at  $n$ . These can be plotted against  $\kappa$  as in figure 2.3.2. The vertical distance between the curve and the line equal the growth rate of capital per person, and the crossing point corresponds to the steady state.

**Figure 2.3.2: Another graphical representation of the steady-state.**



If, for instance,  $\kappa > \kappa^*$ , then the growth rate is negative, and  $\kappa$  falls towards  $\kappa^*$  and if  $\kappa < \kappa^*$ , the growth rate is positive and  $\kappa$  increases towards  $\kappa^*$ . The arrows on the horizontal axis indicate the direction of movement of the ratio  $K/L$  over time.

### **2.3.2 The impact of foreign aid in a neo-classical framework.**

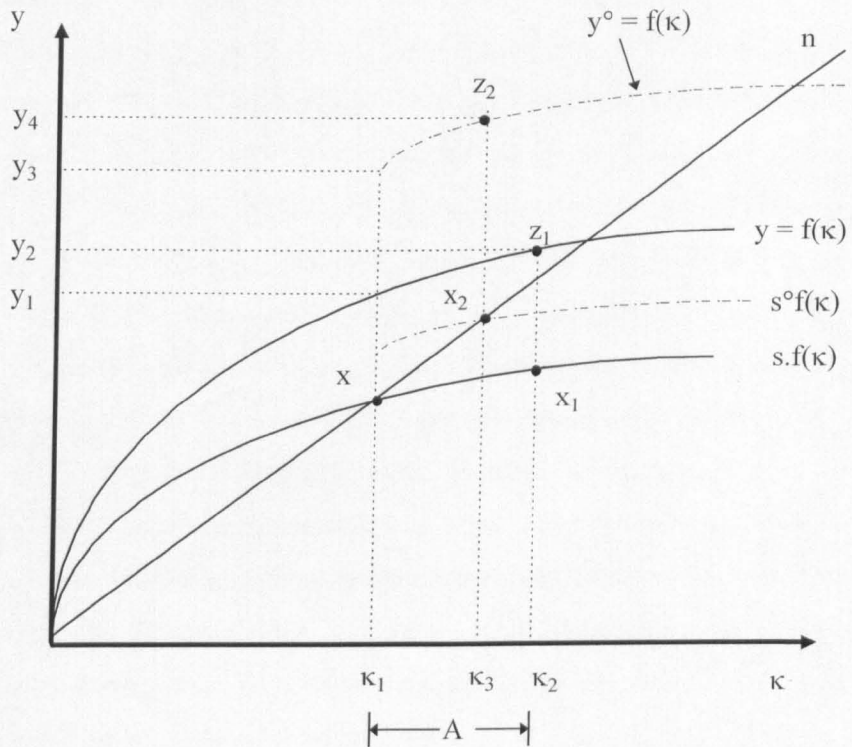
Now we can examine the impact of foreign aid on this economy. Assume that foreign aid is in the form of a grant and is a flow. In the existing literature most of the studies have used the neo-classical model to deal with international capital flows, mainly private, for example Borts (1964), Oniki and Uzawa (1965), Negishi (1965), and Kemp (1968). Eaton (1989) overviews some of these models in a simplified way.

Surprisingly there has been only one study that of Crouch (1973) that has considered the impact of foreign aid in a static neo-classical growth model which is summarised below. In the first instance we consider the case where the donor country gives aid in the form of capital goods. Figure 2.3.3 considers the case where,  $A$ , the amount of the aid is tied to the capital sector (ignoring for the moment the broken lines). The capital-labour ratio rises from  $\kappa_1$  to  $\kappa_2$ . Aid-supported per capita income and per capita consumption are  $y_2$  and  $x_1 z_1$  respectively. The economy stays at that point as long as aid flows in. As soon as aid stops, the economy shrinks back to  $x$  because the capital requirement to keep the capital-labour ratio constant exceeds per capita saving. Hence the impact or benefits of aid prove to be transitory during which the recipient has temporarily enjoyed higher consumption per capita.

Now assume that the donor gives an equal amount of grant aid in the form of consumer goods. In this case income per capita rises from  $y_1$  to  $y_3$ . The aid-supported production function shifts to  $y^o = f(\kappa)$  and consequently the saving

per capita curve shifts upward to  $s^o f(\kappa)$  which is parallel to  $s.f(\kappa)$ . Because at  $\kappa_1$  saving per worker exceeds the capital requirement, the capital-labour ratio rises to  $\kappa_3$ . This further increases the income per capita to  $y_4$  and consumption per capita is  $z_2 x_2$ . Again this situation will persist while aid is received. As soon as it is withdrawn, all the ratios drop back to their non-aid levels.

**Figure 2.3.3: The impact of Foreign Aid in the neo-classical model.**



What is interesting to note in this analysis is that income per capita and consumption (saving) per capita are higher when aid is allocated in the form of consumer goods rather than capital goods. Also if the recipient has the ability to increase its propensity to save, a higher income per capita can be reached (but in the long run there will be no growth in per capita terms). A rise in saving rate would, however, reduce current consumption per capita during part of the transition period. The outcome will therefore depend on how households weigh today's consumption against the path of future consumption. For this



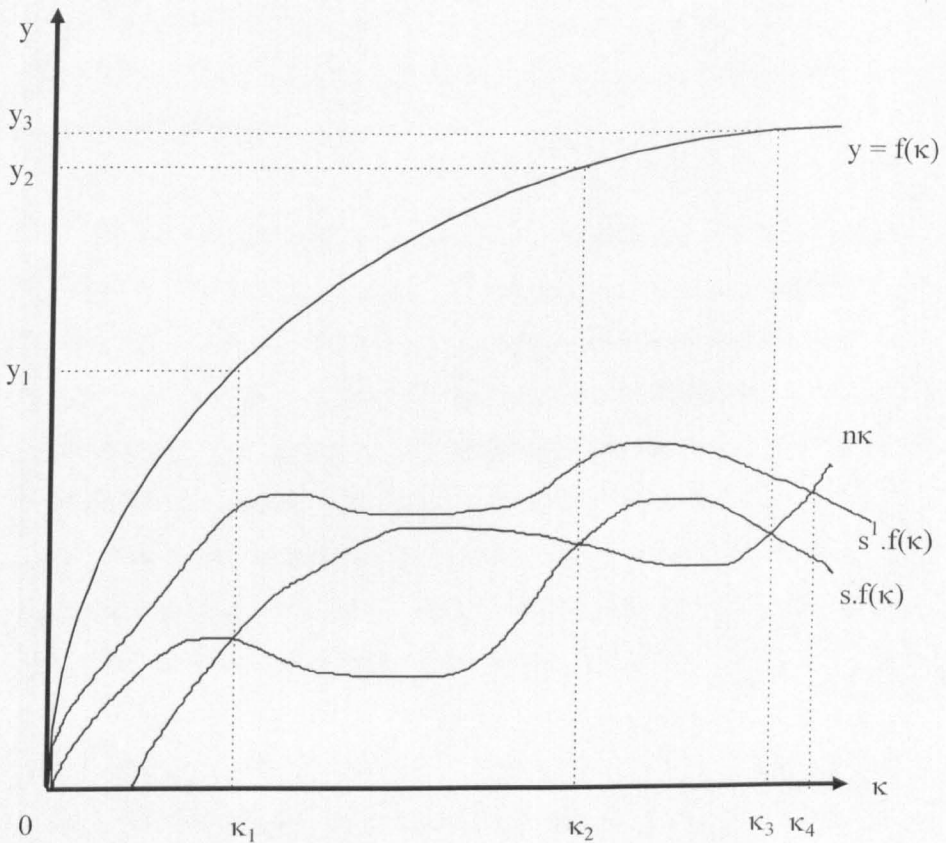
purpose an objective function needs to be identified against which the desirability of an increase in the saving rate can be judged.

From the static model just described, it can be deduced that given the assumptions of the neo-classical model, aid has practically no long run beneficial effects either in the form of capital or consumer goods. Crouch (1973) has attempted an exercise by modifying the assumptions of the neo-classical model and from which long run benefits are perceived. Crouch has applied demographers' explanation about the behaviour of the growth rate of population so that  $n$  is not exogenous but a function of income per capita. Population is a function of per capita income and consequently it generates a capital requirement curve like  $n\kappa$  in figure 2.3.4. The saving per capita is also not constant but reflects the behaviour of the growth rate of the population. Crouch showed that given these conditions, the possibility of a steady state growth equilibrium exists at three different levels of the capital-labour ratio and only two of them are stable (at  $\kappa_1$  and  $\kappa_3$ ). Steady-state growth at  $\kappa_2$  is unstable, the slightest divergence from  $\kappa_2$  sends  $\kappa$  to either  $\kappa_1$  or  $\kappa_3$ . Developing countries are characterised to be at a steady-state growth at  $\kappa_1$ . Such a position is often referred to in the development literature as a 'low level equilibrium trap' [Lewis (1954), Liebenstein (1957) and Nelson (1960)] and implies that a 'big push' or 'minimum critical effort' is required to achieve high levels of output per worker permanently.

Hence if foreign aid in the form of grants of capital goods is not able to increase the country's capital-labour ratio above  $\kappa_2$ , then the benefits of aid will be transitory. However, if the capital-labour ratio is raised above  $\kappa_2$ , it would help the country to "take off" to finally reach  $\kappa_3$  with a higher level of income per capita. Moreover, when the aid is withdrawn, the economy would remain at  $\kappa_3$ . Hence if enough capital is pumped into the economy, higher per capita income levels can be reached permanently.

In case of a generous consumer good aid which could raise the saving per capita curve clear above the  $nk$  curve, would once more allow the recipient country to “take off”. With aid support, a higher capital-labour ratio than  $\kappa_3$  would be attained, for example  $\kappa_4$ . If aid stopped flowing in, the economy would only fall back into steady-state growth at  $\kappa_3$ . Permanent benefits are hence possible in these circumstances.

**Figure 2.3.4: The impact of Foreign Aid under alternative assumptions**



It can also be found from the figure that if foreign assistance is in the form of population control then a sufficient reduction in  $n$  could bring the  $nk$  curve below the concave from above section of the  $s.f(\kappa)$  curve. A higher income per capita per worker can hence be attained in such a case. Crouch's conclusion was that for foreign aid (either in the form of consumer or capital goods) to have long run beneficial effects on the development of the recipient there must exist a low-level equilibrium trap and also aid must be above a critical

minimum. These are accordingly necessary and sufficient conditions for permanent benefits to occur in a neo-classical framework.

An extension to the Solow model has been developed using Ramsey (1928) methodology that incorporates endogenous determination of the saving rate. The specification of consumer behaviour is a key element in this kind of optimisation model. The model was subsequently refined by Cass (1965) and Koopmans (1965). Many authors have elaborated on this model, for example Romer (1986), Lucas (1988), Grossman and Helpman (1992) and Barro and Sala-i-Martin (1995).

In this model, the households choose consumption and saving to maximise their dynastic utility subject to an intertemporal budget constraint. The households' pattern of per capita consumption is mostly found to depend on the interest rate, the discount rate and the willingness to substitute intertemporally. For instance, if households have a strong preference for smoothing consumption over time (that is, a high willingness to shift consumption from the future to the present), the low rate of investment would imply that the transition to the steady state would take a longer time than if the households are more willing to postpone consumption.

In this model even though saving is endogenously determined, it does not eliminate the convergence property to the steady state as in the static model. The effect of foreign aid whether tied to capital goods or untied would yield the same results as before.

### **2.3.3 Raising labour efficiency in the presence of foreign aid.**

It has been assumed so far that the level of technology is constant over time and following this all per capita variables were constant in the long run. This assumption would be too extreme in a world which is nowadays characterised

with innovation and improvements in the efficiency of labour. Developed countries' per capita growth would have been difficult to maintain by only accumulating capital per worker in the presence of diminishing returns. Technological improvements allow a country to neutralise or even surmount diminishing returns effects on growth, hence enabling the country to grow in per capita terms.

Many donor countries give foreign aid in the form of technical assistance for improving labour efficiency. Attempts to model the impact of this improvement on labour has been ignored in the aid literature. This form of technical assistance can have considerable positive effects on growth in the long run. This type of aid includes scholarships, expert advice, access to sophisticated equipment to carry out research and so on.

To illustrate how it can raise the recipient's long run growth rate, it is assumed that foreign aid is associated with labour-augmenting technological progress. The production function  $Y = F(K, L)$  becomes

$$Y = F[K, L.A(t)] \quad (2.3.11)$$

where  $A(t)$  is the technology index given by  $e^{xt}$  which starts growing at a constant rate  $x$  from the time the aid is obtained (assuming before that  $x$  was zero). The methodology is adapted from Barro and Sala-i-Martin (1995) with slight modifications. Maintaining that all saving is invested:

$$\dot{K} = s.F[K, L.A(t)] \quad (2.3.12)$$

Dividing both sides by  $L$ :

$$\frac{\dot{K}}{L} = s.F[\kappa, A(t)] \quad (2.3.13)$$

Substituting equation (2.3.13) into (2.3.8) and rearranging terms to get

$$\dot{\kappa} = s.F[\kappa, A(t)] - n\kappa \quad (2.3.14)$$

Comparing equations (2.3.9) and (2.3.14), it can be seen that output per capita now depends on the level of technology,  $A(t)$ .

Dividing both sides of equation (2.3.14) by  $\kappa$  to get the growth rate of  $\kappa$ :

$$\xi_{\kappa} \equiv \frac{\dot{\kappa}}{\kappa} = s \cdot F[\kappa, A(t)] / \kappa - n \quad (2.3.15)$$

Notice that in equation (2.3.15) the average product of capital,  $F[\kappa, A(t)] / \kappa$ , increases over time because of the growth in  $A(t)$  at the rate  $x$ . In terms of figure 2.3.2, the downward sloping curve,  $s \cdot f(\kappa) / \kappa$ , now shifts continually to the right.

We know that the steady-state growth rate,  $\xi_{\kappa}^*$ , should be constant (recall that without technological progress,  $\xi_{\kappa}^*$  was zero in the steady state). Given  $s$  and  $n$  are exogenous, equation (2.3.15) implies that the average product of capital is constant in the steady state. Under constant returns to scale the average product of capital equals  $F[1, A(t)/\kappa]$  and is therefore constant only if  $\kappa$  and  $A(t)$  grow at the same rate, i.e.  $\xi_{\kappa}^* = x$ .

Since  $\kappa$  and  $A(t)$  grow at the same rate, we can rewrite the production function in intensive form as

$$\hat{y} = F(\hat{\kappa}, 1) \equiv f(\hat{\kappa}) \quad (2.3.16)$$

where  $\hat{y} \equiv Y/L \cdot A(t)$  and  $\hat{\kappa} \equiv K/L \cdot A(t)$ .

Proceeding as before we can derive the dynamic equation for  $\hat{\kappa}$  :

$$\xi_{\hat{\kappa}} = s \cdot f(\hat{\kappa}) / \hat{\kappa} - (n + x) \quad (2.3.17)$$

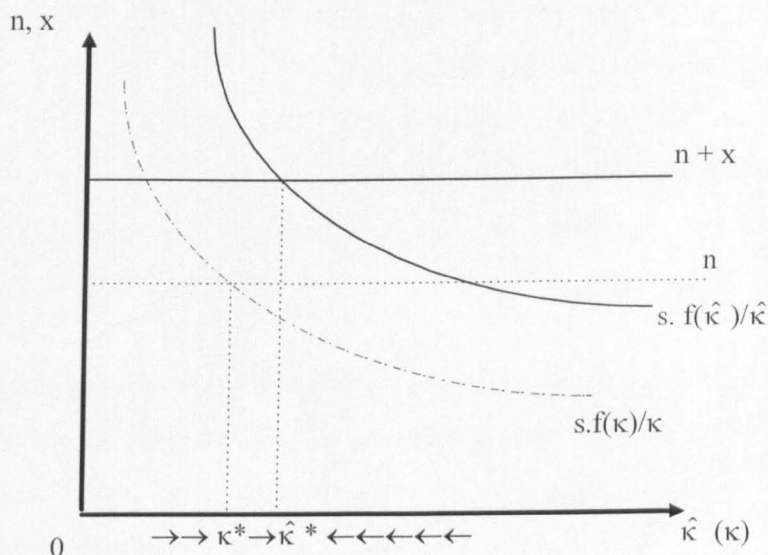
since steady-state growth of  $\hat{\kappa}$  is zero, the steady-state value  $\hat{\kappa}^*$  satisfies the condition

$$s \cdot f(\hat{\kappa}) / \hat{\kappa} = (n + x) \quad (2.3.18)$$

The above equation can be illustrated in terms of figure 2.3.2 as the one shown in figure 2.3.5. In the new steady-state, due to a labour-augmenting technology, the variables  $\hat{\kappa}$ ,  $\hat{y}$ ,  $\hat{c}$  are now constant and grow in the steady-state at the exogenous rate of technological progress,  $x$ . Observe that the steady-state growth has increased from  $\kappa^*$  to  $\hat{\kappa}^*$ . The economy which was constantly growing at the rate  $n$  is now able to grow at a higher rate  $n + x$ . All the variables—capital stock, income, consumption (saving) are now growing at this new rate  $n + x$ . Hence foreign aid in this form is able to have beneficial

effects in the long run as long as technical assistance is flowing in the economy. If foreign aid ceases, then growth will shrink back to its former level. To experience permanent effects, the recipient should find ways to assimilate and learn in the process so that when aid stops, the economy can still grow at the rate  $n + x$ . The recipient should make the technology become 'endogenous', so that it is generated within the economy. It is only then that aid will prove to have long run beneficial effects. The question which remains is whether developing countries have such technological potentials.

**Figure 2.3.5: Labour Efficiency Improvement under Foreign Aid.**



We have been talking about long run effects, but how long is the 'long run'? Sato (1963) and Sato (1966) has tried to calculate the length of time that it might take for an economy to attain balanced growth by assuming 'plausible' values of the parameters in the model. He found that a slight change in the propensity to save induced by fiscal policy can result in adjustment time to be very long — possibly over a hundred years!

Recent developments in growth theory have attracted more attention into a new formulation in the mid 1980's. This questions the mechanisms that drive

an economy to its long run steady state. This kind of model inspired by Romer (1986), has been called the endogenous growth model to which we now turn to in the next section.

## **2.4 The Endogenous Growth Models.**

### **2.4.1 An overview**

The neo-classical growth model without doubt has brought many useful insights about the path to steady-state growth. The fundamental mechanism is the variability of the capital-labour ratio (being an improvement over the Harrod-Domar model) while other variables such as savings rate and growth of labour force are assumed to be exogenous and are independent in the process. The model also relies on a well-behaved production function satisfying the Inada conditions, where diminishing returns to capital prevail. In recent years some growth theorists, such as Romer (1986), started to challenge the already predetermined long run growth which was the results of exogenous assumptions of certain variables.

We have seen that the impact of foreign aid in the neo-classical model is transitory unless the basic assumptions are ruled out. Let us assume that now there is the potential for endogenous growth in the sense that there is an absence of diminishing returns to capital. We take a simple production function without diminishing returns as

$$Y = AK \quad (2.4.1)$$

where  $A$  is an index for the level of the technology and is a positive constant. Dividing both sides by  $L$ , output per capita is given by

$$y = A\kappa \quad (2.4.2)$$

where  $y = Y/L$  and  $\kappa = K/L$ . Notice that the average and marginal products of capital are constant at the level  $A > 0$ . Assuming that the saving rate is exogenous and constant, we can substitute  $f(\kappa)/\kappa = A$  in equation (2.3.10),

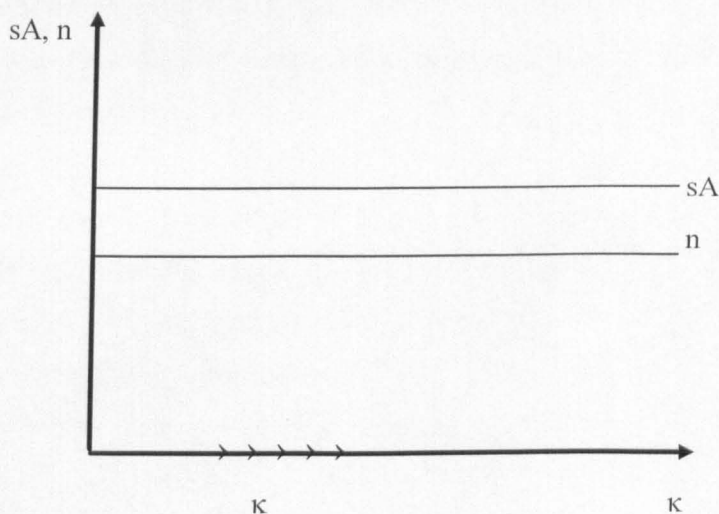
get:

$$\xi_k = \frac{\dot{k}}{k} = s \cdot f(k)/k - n, \text{ of the neo-classical model from the earlier section to}$$

$$\xi_k = \frac{\dot{k}}{k} = s \cdot A - n \quad (2.4.3)$$

In terms of figure 2.3.2, now the downward sloping curve,  $s \cdot f(k)/k$  is replaced by the horizontal line at the level  $sA$  in figure 2.4.1. Assuming that  $sA > n$ , we can find that perpetual growth occurs (even when we assume zero technological progress as opposed to the neo-classical model). The growth of  $k$ ,  $\xi_k$ , is given by the vertical distance between the two lines,  $sA$  and  $n$ . Because the two lines are parallel,  $\xi_k$  is constant and notice that it is independent of  $k$ . Hence  $k$  always grows at the steady-state rate,  $\xi_k^* = sA - n$ . (see Barro and Sala-i-Martin (1995) for further details).

**Figure 2.4.1: Endogenous Growth Model.**



Notice that because  $y = Ak$ ,  $\xi_y$  also equals  $\xi_k^*$  at every point in time. Consequently given  $c = (1 - s)y$ , the growth rate of  $c$  equals  $\xi_k^*$ . Hence, all per capita variables in the model grow at the same rate given by:

$$\xi = \xi^* = sA - n$$



In this model the per capita growth rate depends on the behavioural parameters of the model, such as saving rate, level of technology and the rate of population growth. For instance, a higher saving rate leads to a higher rate of long-run per capita growth. Even an improvement in the level of technology will lead to higher growth rates.

#### **2.4.2 Foreign Aid in Endogenous Growth Models.**

If an economy is characterised by the form of production technology described above, then perpetual positive growth is observed and in such a case there is no point in claiming foreign assistance since the economy is in a self-sustaining position unless  $sA < n$ . In case  $sA < n$  then an inflow of foreign aid sufficient to raise the  $sA$  line above  $n$  would generate incessant positive growth rates. Again if the flow of foreign aid is relinquished, then aid's impact will only prove to be temporary. But in the case where a donor supplies a new form of technology to the recipient country, which is to remain forever with the recipient even though the inflow ceases, then the impact of aid might prove to be permanent in this context (for e.g. due to spillover effects, learning-by-doing, improving human capital),.

To illustrate this, let us take a case where foreign aid takes the form of a grant of capital goods ( $C_{Aid}$ ) and which is a flow (e.g. project aid). Also we make some assumptions on the characteristics of the labour force,  $L$ . We assume that the attributes of the workers are such that they are endowed with some 'dormant' knowledge which as yet has been unexploited mainly because of the existing technology. We also make the assumption that once a new technology is made available, the workers' efficiency and performance consequently improve (the 'dormant' knowledge becomes 'active') and is then endowed permanently to enable a continuous labour-augmenting technology, even though the source of the technology is withdrawn. We can reasonably predict

that there might be a reduction in output when the source of the technology is excluded.

It is quite evident that the rate of technological progress in a sector or activity is in part a response to changes in economic variables within the sector (we are here assuming a boost due to foreign aid). To realise potential gains from the foreign capital-embodied technological change, a high inflow of foreign aid investment is essential. We have seen from Crouch's (1973) study and the theory of 'big push' earlier that the magnitude of foreign aid is of importance to developing countries, thus in what follows we will try to model this magnitude explicitly. Of course, the rates of investment and output are still key elements in theories of endogenous technical change such as Arrow's (1962) "learning by doing" in which labour productivity increases with the level of cumulative gross investment or output. In our case we rather assume that labour productivity increases due to the level of cumulative foreign aid gross investment. To model this form of endogenous technological change we proceed as follows.

Suppose that the pre-aid production function is characterised by the neo-classical production function taking a Cobb-Douglas form as

$$Y = AK^\alpha L^{1-\alpha} \quad 0 < \alpha < 1 \quad (2.4.4)$$

where  $A$  is the domestic index of the level of technology and is greater than zero. The steady-state for this economy is then at  $Z$  as illustrated in figure 2.4.2.

Suppose that a donor country grants some capital goods to the domestic country and assuming that a new form of technology accompanies the capital goods. (This is a case where the recipient has to purchase or spend the aid money in the donor country). This new form of technology can be viewed to reflect the technology level in the donor country which can be assumed to be superior if the donor country is technologically more advanced than the

recipient, which is often the case for developing countries. Let us assume that the foreign aid (capital) is some proportion of the recipient country's capital stock, for instance  $C_{Aid} = \lambda K$  and the technology associated with it be  $B$ .

As soon as this capital and technology is available labour-augmenting technology becomes 'active', so that  $L$  in equation (2.4.4) becomes  $L.D(t)$  where  $D(t) \equiv e^{\bar{x} + f(B)}$  or  $D(t) \equiv e^p$  where  $p = \bar{x} + f(B)$ . Hence,  $p$  is made up of  $\bar{x} (> 0)$ , which represents the technical progress which is autonomous and is permanently endowed as discussed above, and is a function of  $B$ . If  $B$  increases then the recipient country will benefit more in terms of labour-augmenting technological progress. Here it is assumed that the autonomous labour augmenting technology,  $\bar{x}$ , will become endogenous to the recipient in the process when foreign aid flows in and will not stop once aid ceases. We can think of a case where the foreign aid encompass both physical and human capital. We can write the production function as<sup>3</sup>

$$Y = AK^\alpha [L.D(t)]^{1-\alpha} + B\lambda K \quad (2.4.5)$$

The first term of the production function in equation (2.4.5) exhibits constant returns to scale and positive and diminishing returns to labour and capital, however when considering the second term, assume that  $\lambda > 0$  and is sufficiently large, one of the Inada conditions is violated because:

$$\lim_{K \rightarrow \infty} (F_K) \Rightarrow B\lambda > 0.$$

We can write equation (2.4.5) in per unit of effective labour as

$$\hat{y} = A \hat{k}^\alpha + B\lambda \hat{k} \quad (2.4.6)$$

where  $\hat{y} \equiv Y/[L.D(t)]$  and  $\hat{k} \equiv K/[L.D(t)]$ . The average product of capital is given by:

$$\frac{f(\hat{k})}{\hat{k}} = A \hat{k}^{-(1-\alpha)} + B\lambda \quad (2.4.7)$$

which is decreasing in  $\hat{k}$ , but approaches  $B\lambda$  as  $\hat{k}$  tends to infinity.

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<sup>3</sup> This formulation was first brought out by Jones and Manuelli (1992).

The dynamics of this model can be analysed with the usual expression for  $\xi_{\hat{k}}$  from equation (2.3.17):

$$\xi_{\hat{k}} = s \cdot \frac{f(\hat{k})}{\hat{k}} - (n + p)$$

Substituting the expression for  $\frac{f(\hat{k})}{\hat{k}}$  from equation (2.4.7), we get

$$\xi_{\hat{k}} = s \cdot [B\lambda + A\hat{k}^{-(1-\alpha)}] - (n + p) \quad (2.4.8)$$

Figure 2.4.2 shows that the first expression on the right-hand side of equation (2.4.8) is downward sloping, and the line  $(n + p)$  is horizontal. In this case as  $\hat{k}$  tends to infinity, the curve approaches the positive quantity  $sB\lambda$ , rather than 0 as in the ‘pure’ neo-classical case. If  $sB\lambda > n + p$ , as assumed in the figure, then the steady-state growth rate,  $\xi_{\hat{k}}^*$ , is positive.

The model yields endogenous steady-state growth but also predicts conditional convergence as in the neo-classical model because of the inverse relation between  $\frac{f(\hat{k})}{\hat{k}}$  and  $\hat{k}$ . This is due to the first term of equation (2.4.6).

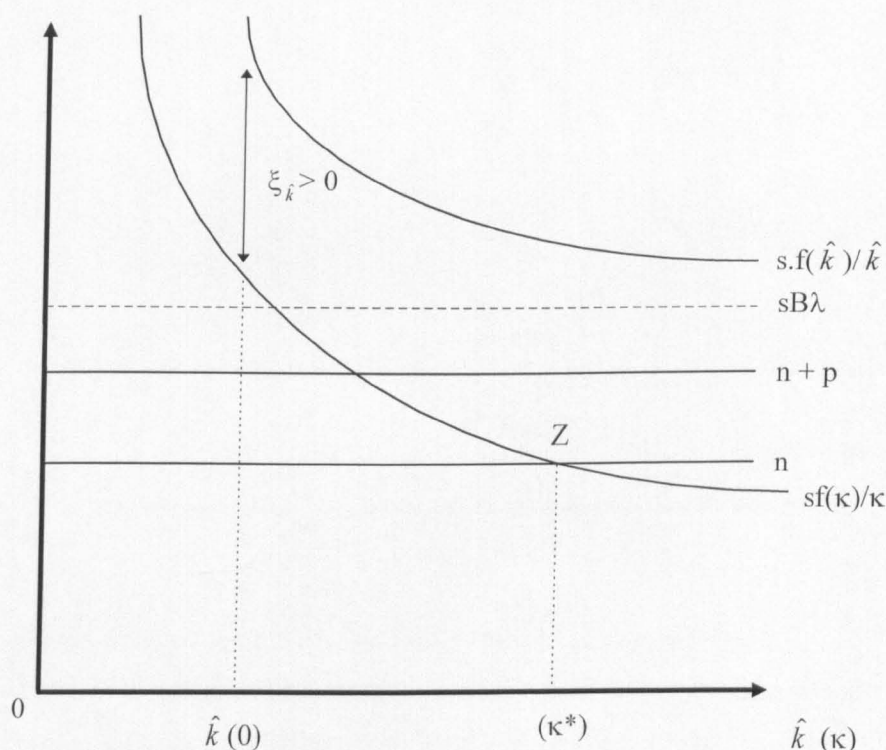
It is now interesting to observe what is going to happen when the donor ceases its aid allocation. Under this instance, the fundamental expression characterising the steady-state from equation (2.4.8) becomes:

$$\xi_{\hat{k}} = sA\hat{k}^{-(1-\alpha)} - (n + \bar{x}) \quad (2.4.9)$$

because  $f(B) = 0$ . The steady-state capital-labour ratio settles at  $Z_1$  as illustrated in figure 2.4.3. Hence the economy ends up achieving a higher growth rate  $(n + \bar{x})$  compared to  $n$  earlier) despite a discontinuity of aid flows. But notice that the economy is no more exhibiting endogenous growth which generated a positive steady-state growth rate.

**Figure 2.4.2: The Impact of Foreign Aid in the Endogenous Growth Model with Labour Augmenting Technology.**

$s, B, \lambda, n, p,$   
 $\hat{k}, \kappa$

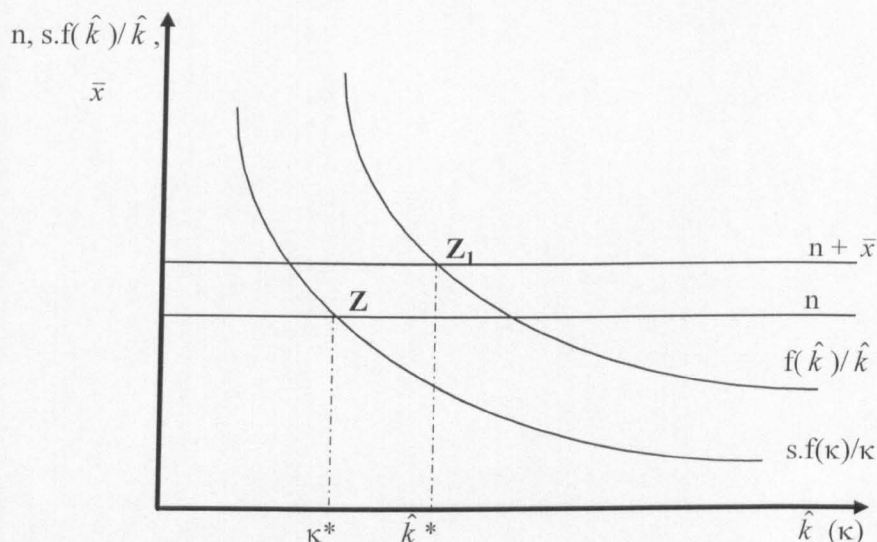


At  $Z_1$ , the variables  $\hat{k}$ ,  $\hat{y}$ ,  $\hat{c}$  are constant and the per capita variables  $\kappa$ ,  $y$ ,  $c$  now grow in the steady state at the rate  $\bar{x}$ . The levels of capital stock, income and consumption (saving) grow at the rate  $n + \bar{x}$ .

In Figure 2.4.3, we can observe that if the recipient has a low initial capital stock per effective worker, let say  $\hat{k}(0)$ , then the economy will grow faster in per capita terms than if it had a higher initial capital stock per effective worker. We can here think of an economy which is highly agrarian with a negligible amount of domestic capital stock per effective worker and where a donor decides to inject some capital goods into that economy. The growth rate in this case will be very high assuming that the productivity of capital is high. In

fact if rising average productivity is observed, then the curve  $s.f(\hat{k})/\hat{k}$  will be upward sloping.

**Figure 2.4.3: The Impact when Foreign Aid stops.**

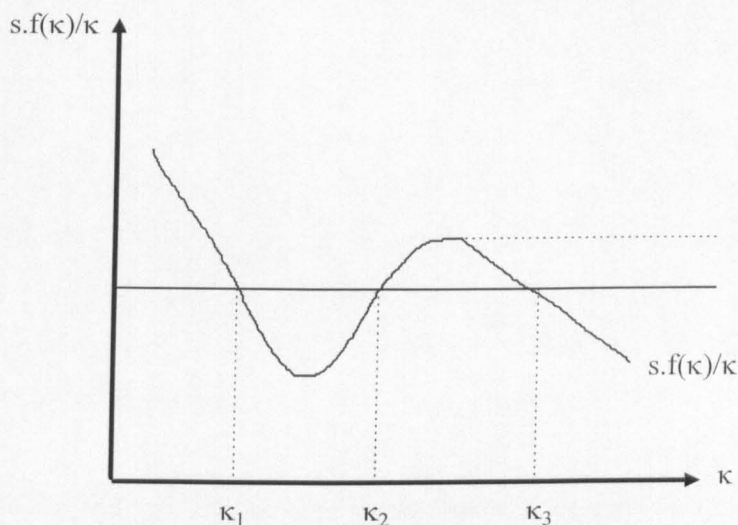


The effectiveness of the foreign aid (and also foreign capital) depends on the magnitude of  $\lambda$  which in a sense compares the amount of foreign capital in conjunction with domestic capital. As seen also in the neo-classical case, for an economy to “take off” the amount of foreign assistance should be significant. To illustrate this in this model let us assume that the  $s.f(\kappa)/\kappa$  curve behaves as shown in figure 2.4.4. We assume that the saving rate is constant but the production is characterised first by diminishing returns, so that the average product of capital declines with  $\kappa$  but experience increasing returns at some point afterwards, and either asymptotes a positive value (as shown by the dashed portion in figure 2.4.4) or again experience diminishing returns.

The displayed pattern of  $s.f(\kappa)/\kappa$  in figure 2.4.4 can be observed when an economy is highly agrarian where diminishing returns tend to prevail. With development the economy diversifies into the production of manufactures, industry and services which tend to generate increasing returns. The  $s.f(\kappa)/\kappa$  curve becomes upward sloping. Consequently, the economy can be subject to

either diminishing returns or converges to a positive value depending on the policy in existence.

**Figure 2.4.4: The Impact of Foreign Aid in the poverty trap case.**



In figure 2.4.4, the steady state  $\kappa_1$  is a stable one since when  $\kappa < \kappa_1$ ,  $\xi_k > 0$  and when  $\kappa > \kappa_1$ , at least in an interval,  $\xi_k < 0$ . Hence  $\kappa_1$  is a stable steady state: it is a poverty trap as discussed earlier. The steady state  $\kappa_2$  is an unstable one because  $\xi_k < 0$  applies to the left, and  $\xi_k > 0$  applies to the right. Thus if the economy starts with an initial capital stock somewhere between  $\kappa_1$  and  $\kappa_2$ , then its tendency is to return to the development trap at  $\kappa_1$ , whereas if it manages somehow to grow further above  $\kappa_2$  then it will tend to grow further to reach still higher levels of  $\kappa$ .

The dashed portion of the curve,  $s.f(\kappa)/\kappa$ , assumes that the growth rate asymptotes to a value that exceeds  $n$  and the economy is capable of endogenous steady-state growth. If donors give foreign aid that raises  $\kappa$  to a level below  $\kappa_2$ , then the economy would still return over time to  $\kappa_1$ . The economy would thus enjoy temporarily higher levels of income and consumption, but would not make a permanent escape from poverty. The implication is that, as Crouch (1973) mentioned, a relatively small level of

international assistance would not achieve long-run economic development. A sufficiently large amount of foreign capital which enables the country to be above  $\kappa_2$  would place the economy on a path that leads eventually to the high-level steady state,  $\kappa_3$ , or possibly to endogenous steady-state growth.

In contrast to the neo-classical growth model, a temporary policy of raising the saving rate can make the country escape the poverty trap. If the high saving rate is maintained long enough so that  $\kappa$  surpasses  $\kappa_2$  and if the saving rate is then lowered back to its initial value, then the economy would not revert back to the poverty trap [see Barro and Sala-i-Martin (1995), pp.51]. Hence a policy inducing saving is very effective in this model and analysing the effect of aid on saving is also important.

## **2.5 Knowledge spillovers and technology transfer from foreign aid activities.**

### **2.5.1 The behaviour of the recipient during and beyond the transition phase.**

Similar to the above example, the donor can also introduce new technology endowed in capital goods produced in the donor country to developing countries in the form of foreign aid. The question of course remains whether this technology is appropriate or not. We now try to analyse (by conjecturing) the behaviour of the recipient during the transition phase towards long run growth. Since capital goods is granted to the recipient we assume that the recipient will try to make the most of it by accumulating some knowledge. Arrow (1962) proposed that knowledge might accumulate as firms engage in new activities, but here we assume that the activity remains the same but the new foreign technology which raises labour efficiency can be thought of improving the quality of the firm's product, as if creating a 'new' product. Entrepreneurs also start learning about ('manipulating') the new source of technology so that as they increase the physical capital, they learn simultaneously how to produce more efficiently.



We can think of a case where the recipient accumulates some stock of knowledge from time  $t_1$  to  $t_2$  while foreign aid is flowing in (and assuming that this stops at time  $t_2$ ). The entrepreneurs can then use the experience gained from the cumulative amount of investment that had taken place in the economy between that time to generate additions to knowledge in the course of manufacturing output. The knowledge then contributes to the productivity of resources in subsequent manufacturing activities. The knowledge acquired can be thought to be the outcome of learning-by-doing and learning-by-investing. This consequently spills over the whole economy.

The building up of this knowledge might seem that industrial innovation has little relevance to the growth process in the less developed economies. The less developed countries do not really carry out intensive R&D or make discoveries that are going to be original to the world economy. But these countries do acquire substantial technical change during their industrialisation process by analysing products and processes that are new to the local economy. We can think that entrepreneurs learn also through learning-by-looking. Pack and Westphal (1986) argue that “the minor role of invention in industrialisation simply means that much technological change consists of assimilating and adapting foreign technology” (pp. 105).

The adaptation of technology depends on how fast the developing country is able to ‘catch-up’ with the foreign technology. Abramovitz’s (1986) view on catching up suggests that the productivity levels of countries tend to converge. The hypothesis asserts that being backward in level of productivity carries a potential for rapid advance. The catch-up process is hypothesised to operate by assuming that the level of technology is embodied in the country’s capital stock. Also that the level of labour productivity were governed entirely by the level of technology embodied in capital stock. Abramovitz then assumes that when a leader (in our case the donor) discards old stock and replaces it, the

accompanying productivity increase is governed and limited by the advance of knowledge between the time when the old capital was installed and when it is replaced. In the meantime, lagging countries (the developing ones) have the potential to make a larger leap. Foreign capital injected into a recipient country can embody the frontier of knowledge, but the capital it replaces was technologically inferior. Hence, the larger the technological and, therefore the productivity gap between the donor and the recipient, the stronger the recipient's potential for growth in productivity. *Ceteris paribus*, this would lead to faster growth and the recipient will tend to catch-up faster if it is initially more backward.

The question that arises, however, is if the above hypothesis is true then why are developing countries still lagging behind? The reason for this is that the process of catching up has some limits. Abramovitz suggests that technological backwardness is not a mere accident. Many developing countries have 'tenacious societal characteristics' which accounts for a substantial portion of a country's past failure to achieve as high a level of productivity as economically more advanced countries. In order to be successful, he suggests that these countries should have the 'social capability'. This could be regarded as such factors as years of schooling, political stability, commercial, industrial and financial institutions for instance. Hence, "a country's potential for rapid growth is strong not when it is backward without qualification, but rather when it is technologically backward but socially advanced" (Abramovitz, 1986, pp. 388).

Further to the development of a country's social capability, the pace at which it is expected to catch-up depends on factors limiting the diffusion of knowledge, the rate of structural change, the accumulation of capital and the expansion of demand. Dowrick and Gemmell (1991) further investigated the catch-up hypothesis and also argued that technological spillover gives less developed countries the opportunity to catch-up but found empirically, using a

sample of 114 countries, that developing countries would benefit only if they are above certain ‘structural poverty threshold’. They suggest that once they are above this threshold, these countries are then able to modernise and catch-up through industrialisation. If they are below this threshold, it would be extremely difficult to sustain growth in per capita income to generate savings and investment to further economic development.

Let us take a case where a recipient country has the ‘social capability’ and is above some ‘structural poverty threshold’ and see the impact on growth when foreign aid in terms of capital flows in the country. As Pack and Westphal (1986) argued, the process of assimilating a new technology in less developed countries will depend how much entrepreneurs can absorb. Let us assume that the entrepreneurs of developing countries manage to assimilate efficiently foreign technology and are in a position to build up on the accumulated stock of knowledge as from time  $t_2$ . Following Arrow (1962), we assume that knowledge and productivity gains come from investment and production. And because knowledge is a public good (that is, nonrival), the knowledge spills over instantly across the whole economy. We also discuss further where the recipient starts ‘learning’ or imitating via trade. If we assume that the foreign aid ceases at time  $t_2$ , then the production function for a firm  $i$  (with labour-augmenting technology still in place due to the accumulated knowledge) becomes:

$$Y_i = F(K_i, M_i, L_i) \quad (2.5.1)$$

where  $L_i$  and  $K_i$  are the conventional inputs, and  $M_i$  is the index of the accumulated knowledge from time  $t_1$  to  $t_2$  when the foreign aid was flowing in. If we assume that each firm is now able to build on the acquired stock of knowledge and by assuming knowledge to be a public good implies that the change in the firm’s technology term,  $\dot{M}_i$ , corresponds to the economy’s overall learning and is therefore proportional to the change in the aggregate capital stock,  $\dot{K}$ . [We follow here Barro and Sala-i-Martin (1995)].

Following the assumptions made, we can replace  $M_i$  by  $K$  in equation (2.5.1) and write the production function for firm  $i$  as:

$$Y_i = F(K_i, K, L_i) \quad (2.5.2)$$

If  $K$  and  $L_i$  are constant, then each firm faces diminishing returns to  $K_i$  as in the neo-classical model. But when each firm expands  $K_i$ , then  $K$  also increases and provides a spillover benefit that raises the productivity of all firms. Because equation (2.5.2) is homogeneous of degree one in  $K_i$  and  $K$  for given  $L_i$ , that is, there are constant returns to capital at the social level—when  $K_i$  and  $K$  expand together for fixed  $L$ . This constancy of the social returns to capital will yield endogenous growth.<sup>4</sup>

If a recipient country behaves as we have conjectured, then the country will be able to achieve endogenous growth and be self-sustaining, at least in the short run. Further to this Grossman and Helpman (1991) mention that if the economy is ‘very’ open, that is, well integrated into the world economy, there is the possibility for innovation and growth. This is because when a country “interacts with the outside world [it] may gain access to the large body of knowledge that has already been accumulated in the international community, as well as to some of the new discoveries that are being made there.” (pp. 166).

They also argue that when residents of a country meet and interact with foreign counterparts, they may find occasions to learn technical information that contributes to their country’s stock of general knowledge. These possibilities would never arise if the country restricts trade or remains closed. We can plausibly assume that the local knowledge stock increases with the number of commercial interactions between domestic and foreign agents for several reasons. First, the larger the volume of international trade, the greater presumably will be the number of personal contacts between domestic and foreign individuals. These contacts may involve an exchange of information contributing to more knowledge. Opening up to international trade is said to

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<sup>4</sup> For a formal proof see Barro and Sala-i-Martin (1995).

spur increases in domestic efficiency. There is an implicitly challenge response mechanism induced by competition; domestic industries are forced to adopt new technologies, to reduce “X-inefficiency”, and generally to reduce costs wherever possible. According to this argument, export expansion is good and so is import liberalisation. Second, through the importation of goods local researchers have a chance to examine and inspect them to further their knowledge by improving the quality of local products. Third, when exporting goods, foreign importers may suggest ways to improve the manufacturing process. Hence, we can reasonably assume that knowledge and the extent of spillovers between a country and the rest of the world increases further with the volume of trade.

Trade, in a sense, facilitates the transmission of technical information from foreign sources. Consequently an integrated economy will enjoy productivity gains in the research lab that spur its technological progress. This can take the form a pure innovation which stems from local technological improvements (which we may assume to be less common in developing countries) and also through imitation, where the domestic country uses the foreign source of knowledge generated in more advanced nations without any cost. In this regard, we might suggest that more trade, that is, the more open is an economy, the faster will be productivity growth. The mechanism works through the ‘catch-up’ effect discussed above. An important part of the ‘catch-up’ process involves exploiting changing comparative advantage, which provides a significant driving force for structural change. In developing countries, economies of scale and size of market have long been considered important in determining growth and structural change. The existence of scale economies implies that widening the market through trade should lead to a reduction in production cost. The argument is usually made in terms of the benefits of an expansion in demand through increased exports. But how much will the country be able to capture from the world’s stock of knowledge to

further its development? Edwards (1992) hypothesises that the rate of knowledge accumulation in a small open economy can be written as:

$$\frac{\dot{A}}{A} = \left\{ \alpha + \delta \left( \frac{W - A}{A} \right) \right\} + \beta \omega \quad (2.5.3)$$

where  $A$  represents the stock of accumulated knowledge and its changes,  $\dot{A}$ , as 'technical progress'.  $\alpha$  and  $\delta$  are exogenously given parameters,  $W$  is the stock of world's (appropriable) knowledge (or in our case as the donor's stock of knowledge),  $\omega$  is the rate of growth of the world stock of knowledge, and  $\beta$  is a parameter ( $0 < \beta < 1$ ) that measures the country's ability to absorb inventions generated in the rest of the world. Described as above, the rate of technological progress depends on some basic rate of innovation,  $\alpha$  (assumed to be exogenous),  $\delta(W - A)/A$  which is the 'catch-up' term suggesting that technological improvements will be faster if the gap between the recipient's level of know-how and that of the world's (or donor's) accumulated stock of appropriable knowledge is larger, and finally on the term  $\beta\omega$  which captures the world's (or donor's) technical progress that is absorbed by the recipient country. Edwards predicts that  $\beta$  is negatively related to the level of trade distortions in the economy. Hence, a less distorted economy would benefit more in terms of productivity growth.

### **2.5.2 Some reservations on technology transfer.**

So far we have hypothesised how technology transfer in terms of know-how, knowledge about production methods, processes, techniques, spillovers, diffusion, and application of this knowledge to economic activity, affects an economy in terms of growth and productivity. This mechanism is said to work better when the country is less distorted and more open to international trade. Despite continuous struggling efforts of many developing countries, though reducing their trade barriers and receiving continuing assistance from the international community, find themselves lagging behind in growth and

productivity. Evidence suggests that the industrialisation experience of many developing countries based on modern technology, appears to have fallen much short of theoretical expectations. Growth has taken in a large number of instances, but development remains questionable, partly but importantly, as a result of technological distortions.

Some plausible reasons can be forwarded to explain the failure of 'catching-up' with the developed countries. First, as Abramovitz (1986) suggests, it is because of the 'social capability' which is dampened in these developing countries. Without this social capability a developing country will not have the potential for rapid advance. It is a common feature to observe political unrest, low literacy rate, etc. in Latin American and African countries where most of the developing countries are found. Second, as Dowrick and Gemmell (1991) showed empirically, developing countries might 'catch-up' technologically provided they are above some threshold level of infrastructural development. In fact they found that mostly African countries are below this threshold level, as a result their marginal product of capital is very low. Another finding was that technological spillover were unavailable to the least developed countries to assist their productivity growth. In this context, the financing of the building up of infrastructure by the International Monetary Fund (IMF) and World Bank in those countries will prosper future growth.

Another reason for the failure of technology transfer is that when the developing countries are engaged in trade, they export mainly primary commodities which do not benefit much from technology transfer. Had they been trading in manufactured goods, they would have benefited a lot from technology spillovers. Along this argument imported technology has not suited to the developing countries' needs. The technology tends to be capital intensive and has failed to make impact on problems of unemployment in these countries. It is often argued that capital intensive bias of such technology is a function of the 'factor configuration' facing developed countries

themselves as suppliers of technology. As a result, the technology they export hardly satisfies the 'surplus' labour supply situation in developing countries, which more often than not, demands the use of labour intensive techniques. Hence the relevancy of the concept of appropriate or intermediate technology in the development objectives of many developing countries. This has raised doubts about the effectiveness of imported technology in terms of structural transformation. Also, it is sometimes held that imported technology is not properly absorbed and assimilated in developing countries.

In our theoretical explanation above, we have assumed that the donor is altruistic. This assumption is sometimes too strong, because very often the donor has a tendency to tie technology inputs and use restrictive business practices. Often the recipient is prohibited to make use of alternative technology as part of the technology package. This has limited prospects for the use and development of indigenous technology in developing countries. Further, it prevents developing countries from resorting to cheaper and perhaps 'more appropriate' technology substitutes or complements, when these are available in the international market. On top of that, donors sometimes impose royalties, licence fees or know-how agreements which increase prices of the goods being produced by using the imported technology. This weakens the bargaining position of developing countries and more to their balance of payments difficulties.

Developing countries are characterised by a set of distortions which occurs in factor market, and imported technology is said to aggravate income distribution problems and therefore economic inequality in developing countries. For instance, the use of a capital intensive technique means that the share of income going to the owners of capital is greater than that going to labour.



Hence our discussion suggests that technology transfer and spillover effects as emphasised theoretically may not work properly well in practice because of the above mentioned reservations which are encountered by developing countries. In order to obtain the benefits accrued in technology transfer, it would be advisable for donors to carefully judge the 'appropriateness' of such technology and the costs to the recipients to make such technology be one of the main factors in accelerating their growth performance and rapidly industrialising these countries.

### **2.6 Aid as Intermediate Inputs.**

Other ways whereby developed countries have sought to help developing countries are through trade: granting special trade preferences and special prices. Many authors have emphasised that trade, in particular exports, is one of the major determinants of growth. It is argued that exports have both direct and indirect effects which affect growth. Suppose a donor can affect the exports of a recipient by alternative route. For example the EEC allows easy access to Mauritius Export Processing Zone's product through the rules of origin and the Multifibre Arrangement. Despite the fact that this kind of economic assistance is not classified as foreign aid does not mean that it is not important for developing countries. Again in the case of Mauritius, the country benefits from special prices from the EEC for sugar (Mauritius receives three times the world market price). We then expect that these preferences will be reflected on growth through the channels in which they work.

Export oriented policies have been advocated by many especially after the failure of import substitution strategies. There are many direct benefits that help in promoting economic growth. It is argued that exports enable a country to import more goods and services. The country also enjoys comparative advantage in the sense that exports tend to be concentrated in the most

efficient sectors of the economy<sup>5</sup>, hence increasing productivity. There are considerable gains from economies of scale due to an increase in the market size. Consequently, it enables production on a large scale thereby reducing unit costs. Export expansion acts as an injection into the economy which increases the level of aggregate demand through the foreign trade multiplier. Expanding the export sector also generates more employment opportunities.

Added to this list of direct benefits of exports are secondary effects such as encouraging additional investment in ancillary industries set up to supply and service the operations of the main export industries. It also induces foreign investment and encourages an increase in the flow of technological knowledge and market innovations. The exports sector is said to generate positive externalities on nonexport sectors through more efficient management styles and improved production techniques. This in turn reallocates resources efficiently. Another effect which was pointed out earlier was that exports may loosen a binding foreign exchange constraint and allow increases in productive intermediate imports and hence result in the growth of output.

Given the benefits that arise from exports, if foreign aid (as special prices, trade preferences, improving the quality of the product, etc.) could expand exports, then we can expect positive effects on: output growth, production of non-export goods and services, reallocation of resources, externality effects and total factor productivity. We also expect to observe increases in the availability of foreign exchange and putting the country in a better position to deal with external shocks<sup>6</sup>.

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<sup>5</sup> This might not hold for all developing countries, for instance, in Sub-Saharan Africa where exports tend to be concentrated on primary commodities.

<sup>6</sup> These effects have been tested in a non-foreign aid context by Michael (1977), (Heller and Porter, 1978), (Balassa (1978, 1984, 1985), Ram (1987), Kavoussi (1984, 1985), Tyler (1981), Feder (1982), Sheehy (1992), Esfahani (1991), Greenaway and Sapsford (1994) and Sheehy (1993), among others.

The impact of foreign aid on these above mentioned factors will depend on how the donor intends to assist the recipient, that is, the form in which foreign assistance is to be given. We will discuss two ways in which ‘donors’ have given assistance to developing countries, though the first is not strictly speaking considered as foreign aid.

The first could be that of providing some guaranteed markets (by importing the developing countries goods) or adopting some special pricing policy, which is often higher than the world prices. The ‘donor’ in this case can be thought also of removing trade barriers which were in force. The response of the developing country when the ‘donor’ reciprocates its trading policies will bring the developing country to the position where it originally started.

The second form of ‘assistance’ not essentially classified as aid is where donors provide some intermediate inputs to enhance the quality of the developing country’s products (especially in cases of tied aid, see Yeats, 1990 and Jepma, 1994). A stylised fact characterising developing countries is that intermediate and capital goods are not substitutable with domestically produced goods. In a sense, the imported inputs embody technologies that are unavailable to domestic producers and can only be obtained through imports. Policies that limit the availability of such imports, or make them more expensive (tariff, non-tariff barriers, etc.) will lead to poor productivity performance. In contrast, policies that increase the availability of imported inputs or lower their costs —such as an export-led development strategy —will reduce costs for domestic industries and lead to better productivity. In this view, exports are important only as a source of foreign exchange; they permit industries to buy inputs that cannot be produced domestically only at a much greater cost, if at all. High exports permit an economy to import the intermediate input structure of an advanced economy and perhaps facilitate rapid growth. Analysis of the structure of intermediate inputs indicates that an important gain from trade is that it allows a country to achieve through imports

a more advanced intermediate input technology than would be possible through domestic production alone. Increased intermediate imports permit the deepening of input-output linkages, a form of technological change characteristic of industrialisation.

The exports of developing countries are often criticised for their inferior quality and this is one of the reasons they remain uncompetitive in the world market. Indeed, it is often argued that the expansion of manufactured exports of these countries requires some more advanced production technologies and high-quality intermediate inputs, both of which must be imported since — at least in the initial stages of export expansion— domestic producers cannot manufacture them. In this view, intermediate imports could embody advanced technology, and their use can be part of the process of technology transfer.

Let us consider a hypothetical case where a developing country has been traditionally producing output using capital and labour ( $Y = F(K,L)$ ) for domestic consumption and investment only and was constrained from exporting its produce on the world market due to an ‘inferior’ quality. If it is now supposed that a donor supplies some high-quality intermediate inputs through foreign aid which improves the quality of the final product (although through tied aid). This will then help the final product to gain some competitive edge on the world market. Let us assume for the sake of simplicity that the price charged by the donor is equal to the world price.

Coming to the modelling part, inclusion of intermediate inputs in a production function has been investigated by Spence (1976), Dixit and Stiglitz (1977), Ethier (1982), Romer (1987, 1990) and Barro and Sala-i-Martin (1995). We follow here a similar approach of the last of these. We assume that the production function of firm  $i$ , after the inflow of the intermediate inputs in the recipient country, is represented by the following Cobb-Douglas technology of the form given by:

$$Y_i = A \cdot K_i^\alpha \cdot L_i^{1-\alpha-\beta} \cdot \sum_{j=1}^N (X_{ij})^\beta \quad (2.6.1)$$

where  $0 < \alpha < 1$ ,  $0 < \beta < 1$ ,  $\alpha + \beta < 1$ ,  $A$  is a technical factor,  $Y_i$  is output,  $K_i$  is capital input,  $L_i$  is labour input, and  $X_{ij}$  is the employment of the  $j^{\text{th}}$  type of the imported intermediate input. The production function is subject to diminishing marginal productivity of each input,  $K_i$ ,  $L_i$  and  $X_{ij}$ , and constant returns to scale in all inputs together.

If the developing country makes full effective use of the intermediate inputs then the country will be in a position to produce and export more on the international market and thereby increase its trade volume (assuming trade balance). Further to this hypothesis, if the recipient is able to ‘adopt and adapt’ this transfer of technology and satisfies both Abramovitz’s (1986) social capability and Dowrick and Gemmell’s (1991) threshold level of infrastructural development, the recipient could then be able to ‘catch-up’ and experience endogenous growth.

By exporting more on the world market, the domestic country is in a position to import more varieties of intermediate inputs and boost its level of exports. But the variety of intermediate inputs that the country can import depends on the intermediate inputs produced on the world market, not necessarily from the donor’s country because the domestic country has the opportunity to trade with other countries as well and adapt to their technology as discussed earlier. In a way, the donor has ‘opened the door’ for the domestic country to trade internationally and competitively. The imports of intermediate inputs then depend on the rate of innovation on the world market. It is common to assume that the growth rate of intermediate inputs produced on the world market is a constant  $\psi$  and that the growth rate for the variety of intermediate inputs imported, denoted by  $\Phi$ , is less than or equal to  $\psi$  following Romer (1990) and Grossman and Helpman (1991).

Following our discussion on the ‘catch-up’ hypothesis, we can argue similarly that the greater the gap between  $\psi$  and  $\Phi$ , the faster will be the domestic country’s growth rate. Also we can suggest that the greater is the volume of exports, the faster will the domestic country catch-up in terms of productivity growth with more advanced countries.

Will the economy converge to some steady-state or witness endogenous growth? From equation (2.6.1), the additively separable form of the  $(X_{ij})^\beta$  means that the marginal product of intermediate input  $j$  is independent of the quantity employed of intermediate good  $j$  [following Barro and Sala-i-Martin (1995)]. This assumption of independence implies that discoveries on the world market of new types of goods do not tend to make any existing types obsolete. In equation (2.6.1), the marginal product of each type of imported intermediate input,  $\partial Y_i / \partial X_{ij}$ , is infinite at  $X_{ij} = 0$  and then diminishes as  $X_{ij}$  rises. If  $N$  types are available at finite prices at the current time, then the firm will be motivated to use all  $N$  types.

Technological progress in this context takes the form of expansions in  $N$ , the number of imported intermediate inputs available only through foreign aid. If the intermediate inputs can be measured in a common physical unit and are all employed in the same quantity, i.e. in equilibrium,  $X_{ij} = X_i$ , we can then see the effect of an increase in  $N$ . The quantity of output is then given from equation (2.6.1) by

$$Y_i = A \cdot K_i^\alpha \cdot L_i^{1-\alpha-\beta} \cdot N \cdot X_i^\beta \quad (2.6.2)$$

$$\text{or } Y_i = A \cdot K_i^\alpha \cdot L_i^{1-\alpha-\beta} \cdot (N \cdot X_i)^\beta \cdot N^{1-\beta} \quad (2.6.3)$$

For given  $N$ , equation (2.6.3) implies that production exhibits constant returns to scale in  $K_i$ ,  $L_i$  and  $NX_i$ , the total quantity of imported intermediate inputs. For given quantities of  $K_i$ ,  $L_i$  and  $NX_i$ , the term  $N^{1-\beta}$  in equation (2.6.3) indicates that  $Y_i$  increases with  $N$ . This effect, which captures a form of technological progress, reflects the benefit to use more imported intermediate inputs from advanced nations. The benefit arises because of the diminishing

returns to each  $X_{ij}$  individually. For fixed  $K_i$  and  $L_i$ , equation (2.6.3) implies that an expansion of intermediates,  $NX_i$ , encounters diminishing returns if it occurs through an increase in  $X_i$  (that is, in all of the  $X_{ij}$ ) for given  $N$ . Diminishing returns do not arise, however, if the increase in  $NX_i$  takes the form of a rise in  $N$  for given  $X_i$ . Thus, technological change in the form of continuing increase in  $N$  avoids the tendency for diminishing returns. This property of the production function provides the basis for endogenous growth.

Hence, if the domestic country expands its trade and keeps increasing the variety of imported inputs (thus improving the quality of the produce), it will unlock the potential for 'catch-up' and experience endogenous growth, at least in the short run. Under this sort of assistance, the recipient can continue to trade and grow even though this form of foreign assistance stops after some time. This is because the economy is now open to the rest of the world and can reap the beneficial effects of trade. As Edwards (1992) reminds us Lewis' (1955) argument that more open countries (implicitly less distorted) have an advantage in absorbing new ideas generated in the rest of the world. With the liberalisation episodes under the General Agreement on Tariffs and Trade (GATT) of recent Uruguay Round, we would expect long term beneficial effects on the productivity and growth, and also in terms of product quality of the developing countries.

The theoretical model is quite clear that there are potential beneficial impact if aid takes the form of intermediate goods. However, this partial analysis have some shortcomings. Although it is argued that tied aid will not lead to any distortionary effect such as real exchange rate appreciation as the aid funds leak abroad in the form of purchases from the donor (as the money being spent in the donor country), still the recipient can be in a worse situation. Often the price charged, in cases where aid is tied, is very high, higher than the world price. In such circumstances this will lead to an increase in the cost of production rendering the final product in the recipient country to be less

competitive. Also tied aid might lead to an increase in the price on nontradables thereby causing a real exchange appreciation—the Dutch-disease phenomenon. Very often also the wrong type of technology is being transferred which they result either in a waste of resources or becomes costlier as in the case of Kenya for example (Duncan, 1986). Hence the merits should be weighed against any distortionary effect.

## **2.7 Summary and Conclusion**

The neo-classical growth model is seen to provide no escape from the steady state in the long run where the growth in the capital-labour ratio and per capita growth rates are zero. In contrast, the endogenous growth model enables an economy to achieve positive per capita steady state growth rates (assuming  $sA > n$ ) in the long run (which also equals the short run growth rate). Changes in the parameters, for example, the propensity to save, do not affect the long run steady state in the former model, whereas in the latter, an increase in the propensity to save raises the steady state per capita growth rates. The outcome of these two models differ mainly because of the assumption of diminishing returns to capital in the neo-classical model and the absence of these returns in the AK model. In fact the working of diminishing returns determines the convergence speed to the steady state in the neo-classical model. For instance, if diminishing returns set in slowly, then the convergence period is long. Under these circumstances, an increase in the saving rate affects the growth rate for a long time. This then approximates the AK model in the short run.

The AK model is found to be inconsistent with empirical evidence as suggested by Barro and Sala-i-Martin, but when the features of the AK model is combined with the neo-classical model [as done by Jones and Manuelli (1992)] the result is more consistent with empirical evidence. This formulation has enabled the idea to incorporate foreign aid in this form and possibly a model to be tested later.



The implications of all these models for foreign aid are obvious. First, foreign aid has transitory effects in the neo-classical model unless the basic assumptions are ruled out. Second the magnitude of foreign aid is crucial. If aid is to have certain impact on the recipient country it has to be above a certain critical minimum level. In fact the magnitude of foreign aid is better seen when we deal with a combined model featuring endogenous growth where the value of  $\lambda$  explicitly compares the amount of foreign aid with domestic capital. In both models the impact of aid is transitory unless foreign aid is supplied with a new alien technology which enables labour-augmenting technology to become 'active' even when aid ceases. This enables the recipient country to increase its per capita growth rates and allows the economy to 'stand on its feet'. Aid via trade is also another way where a donor can promote growth of recipients. The donor can actually supply some intermediate inputs to improve the recipients' quality of the product so that the recipients can trade more competitively on the world market. If the recipients are able to adapt to new technologies available, they can then have some potentials to 'catch-up' and experience endogenous growth.

The models of growth so far elaborated provide many useful insights about how economic variables can affect growth and how foreign aid impacts on growth. Each of the models certainly have their own limitations especially when they come to empirical testing. Given that we live in the short run, many donors would like to know the impact of the aid flows on the recipient's growth. Many studies have been carried out investigating the aid-growth relationship and the conclusions are overwhelmingly inconclusive. The results differ not only in the sense of the type of models used but also in terms of the methodology as well as the testing techniques used. It would be interesting to test aid's impact using an endogenous growth framework (featuring human capital) which has been hardly used in the literature.

**APPENDIX 2.1*****The Neo-classical Model***

The model is adapted from Jones (1975). First of all, it is assumed that an economy produces only one composite commodity, which it can either consume or accumulate as a stock of capital. A simple proportional savings function is assumed as in the Harrod-Domar model:

$$S = sY \quad 0 < s < 1 \quad (2.3.1)$$

The supply of labour,  $L$ , grows at an exogenous constant proportional natural rate  $n$ , i.e.

$$\frac{\dot{L}}{L} = n \quad (2.3.2)$$

where a dot over a variable denotes a change in the variable.

Ignoring technical progress, the production function takes the form

$$Y = F(K, L) \quad (2.3.3)$$

and is assumed to satisfy the following conditions:

- (i) For all  $K > 0$  and  $L > 0$ ,  $F(\cdot)$  exhibits positive and diminishing marginal products with respect to each input:  $F_K > 0$  and  $F_{KK} < 0$  and  $F_L > 0$  and  $F_{LL} < 0$ .
- (ii)  $F(\cdot)$  exhibits constant returns to scale, making output homogeneous of degree one in capital and labour.

Since (2.3.3) is homogeneous of degree one, it can be written in the 'intensive' or 'per capita' form

$$y = f(\kappa, 1) \quad (2.3.4)$$

where  $y = Y/L$ , per capita income (or average product of labour);  $\kappa = K/L$ , the capital-labour ratio. Note that in this section  $\kappa$  differs from the  $\kappa$  in the Harrod-Domar section where it was defined as the incremental capital-output ratio. The intensive form is assumed to be 'well-behaved' or obey the 'Inada Conditions', following Inada (1963):

- (a)  $f(\kappa) = 0$  when  $\kappa = 0$

(b)  $f'(\kappa) > 0$ , i.e. marginal product of capital is positive for all levels of capital-labour ratio.

(c)  $f''(\kappa) < 0$ , i.e. marginal product of capital diminishes as capital per labourer increases.

(d) At very high levels of the capital-labour ratio, the marginal product of capital becomes very small, i.e.

$$\lim_{\kappa \rightarrow \infty} f'(\kappa) \Rightarrow 0$$

(e) As the capital-labour ratio tends towards zero, the marginal product of capital tends towards infinity:

$$\lim_{\kappa \rightarrow 0} f'(\kappa) \Rightarrow \infty$$

For simplicity, investment is assumed to be non-depreciating and is equal to the change of the capital stock and all saving is invested:

$$\dot{K} = S = sY \quad (2.3.5)$$

where  $\dot{K} = dk = I$ , dividing (5) by  $L$  on both sides yield:

$$\frac{\dot{K}}{L} = \frac{sY}{L}$$

or

$$\frac{\dot{K}}{L} = s \cdot f(\kappa) \quad (2.3.6)$$

Rewrite equation (2.3.6) in terms of per capita variables only. To do so consider  $\kappa = K/L$ . If  $K$  and  $L$  are growing at the same rate then the growth rate of  $\kappa$  will be zero (i.e.  $\dot{\kappa}/\kappa = 0$ ). If the proportionate rate of growth of  $K$ ,  $\frac{\dot{K}}{K}$ , is greater than the proportionate rate of growth of the labour force,  $\frac{\dot{L}}{L}$ , then the capital-labour ratio will obviously be growing, i.e.  $\dot{\kappa}/\kappa > 0$ . Similarly if  $\frac{\dot{K}}{K} < \frac{\dot{L}}{L}$  then  $\dot{\kappa}/\kappa < 0$ . Consequently, it can easily be shown that the rate of

growth of the capital-labour ratio must equal the rate of growth of the capital stock minus the rate of growth of the labour force:

$$\frac{\dot{\kappa}}{\kappa} = \frac{\dot{K}}{K} - \frac{\dot{L}}{L} \quad (2.3.7)$$

We know that  $\frac{\dot{L}}{L} = n$  and is constant, hence

$$\frac{\dot{\kappa}}{\kappa} = \frac{\dot{K}}{K} - n$$

multiply both sides by  $\kappa = K/L$

$$\dot{\kappa} = \frac{\dot{K}}{L} - n\kappa$$

or

$$\frac{\dot{K}}{L} = \dot{\kappa} + n\kappa \quad (2.3.8)$$

Substitute equation (8) in equation (6) and rearrange to get

$$\dot{\kappa} = s.f(\kappa) - n\kappa \quad (2.3.9)$$

This is the fundamental equation of the neo-classical growth model.

# Chapter Three

## The Dual Gap Theory

# **Chapter Three**

## **THE DUAL GAP THEORY**

### **3.1 Introduction**

The growth models developed in the previous chapter implicitly assumed a saving gap. It has been found that even though in some countries sufficient domestic savings were available, growth of income was very low especially in the years where the developing countries were pursuing inward-oriented strategies in the 1950s and 1960s. These poor performances indicated that capital was not the only factor constraining growth. Empirical studies such as those of Chenery and Bruno (1962) for Israel, Manne (1963) for Mexico, Adelman and Chenery (1966) for Greece, Chenery and Strout (1966) for Pakistan, and a theoretical exposure by McKinnon (1964), have all identified further possible constraints on growth. They pointed out the importance of international trade, which helps in promoting growth. Most developing countries, excluding the oil-producing and oil-exporting countries, had a dominant foreign exchange gap, this was clearly seen by the chronic balance of payments deficit on current accounts, while domestic resources remained idle. The extension in this chapter takes into account the role of foreign trade, the changing structure of demand and the allocation of resources. Section 3.2 discusses the lack of foreign exchange as a possible constraint on growth. In section 3.3 and 3.4 we expose McKinnon's (1964) and Chenery and Strout's (1966) classical papers respectively elaborating the two gap theory. Section 3.5 then deals with an assessment of the productivity of foreign aid in the two gap model. Section 3.6 reviews some empirical findings of country-case studies which have used the dual gap model. Section 3.7 addresses some criticisms of the two gap model. In Section 3.8 we provide a discussion concerning which of the two gaps is more relevant and of much importance for policy analysis and decision making. Section 3.9 concludes the chapter.

### 3.2 The Foreign Exchange Gap

In concluding the analysis on aid allocation estimates, Rosenstein-Rodan (1961) pointed out that one of the ‘criteria of eligibility for soft loans are low income per head and a “foreign exchange gap” which is greater than the “resource gap”’. This indicated that foreign trade also plays a very important part in determining growth and aid requirements. In this context the simple Harrod-Domar model does not take into account the open economy. A simple extension of the Harrod-Domar model was developed by Bruton (1955) introducing foreign trade so that :

$$g = \frac{s + u}{k} \quad (3.1)$$

where  $u = \frac{M - X}{Y}$ , M is imports and X is exports.

Equation (3.1) implies that if  $u$  is positive, that is  $M/Y > X/Y$ , then the allowable rate of growth of income is greater than it could be in the absence of trade. Such an excess of imports is only possible if a country is a recipient of aid, credit or foreign investment. Hence, the model indicates that international trade can generate growth and vitalise the role for aid to less developed countries. It is also evident from the above that if  $u$  is negative, that is,  $X/Y > M/Y$ , the percentage rate of growth required to utilise all the increasing domestic capacity is less than it would be in the absence of trade, implying that the binding constraint is the savings-gap. But the major drawback of this model dealing with international trade does not enable us to deduce the importance of this sector particularly when exports is equal to imports and higher volumes of trade will have no beneficial effects upon economic growth.

The foreign exchange gap, as Nixon and Colman (1994) put it, clearly implies that “the import-purchasing power conferred by the value of exports plus capital transfers, may be inadequate to support the level of growth permitted via

investment financed by the level of domestic savings plus those capital transfers, because it still leaves a shortage of key imported inputs". In such a case, productive capacity is under-utilised. In a similar line of reasoning, a savings gap is said to arise when the growth rate permitted by domestic savings is less than that made possible by the availability of foreign exchange. This implies that available capacity is being fully utilised. With this as background we now turn to analyse the details in the dual gap theory.

### **3.3 McKinnon's Dual Gap Model Representation.**

The dual gap theory synthesises the classical and modern views of foreign assistance. On the one hand the traditional view of foreign capital inflows are regarded as a supplement to domestic savings and on the other hand, the modern view stresses that, especially for developing countries, many goods necessary for efficient industrial growth cannot be produced domestically and must therefore be imported with the help of foreign capital inflows. Hence a transfer of external resources enables the recipient country to increase the level of investment and to increase the supply of commodities that are not domestically produced, preventing possible bottlenecks in production. For an understanding of the impact of foreign assistance using the two gap approach, it is perhaps better seen by reviewing McKinnon's (1964) methodology where foreign goods enter as inputs into the production function. The basic Harrod-Domar type production function is used assuming fixed proportion technology given by:

$$Y = \min. (\alpha K_d, \beta K_f) \quad \alpha > 0, \beta > 0 \quad (3.2)$$

where Y is the potential output capacity and also represents total income generated from domestic use of the factors of production.  $K_d$  and  $K_f$  represent domestically produced and imported capital goods respectively. The maximum savings in the economy is given as:



$$\text{Max. } S = sY \quad 0 < s < 1 \quad (3.3)$$

At any time  $t$ , investment,  $I_t$  equals savings  $S_t$  plus foreign capital flows  $F_t$  (i.e.  $I_t = S_t + F_t$ ). Investment needs to be allocated between domestic and foreign capital goods as  $\alpha(\Delta K_d) = \beta(\Delta K_f)$  so that there is an efficient allocation of resources. Without foreign capital transfer, and assuming that sufficient foreign exchange is generated by the exports of domestic capital goods for the acquisition of foreign capital goods, the maximum attainable growth rate will depend on the level of domestic savings only, i.e.  $S_t = \text{Max } S_t$ , which depends on the income generated. The increase in income depends on the level of net investment, and from (3.2)

$$\frac{dY}{dt} = \alpha(\Delta K_d) = \beta(\Delta K_f) = \frac{\alpha\beta}{\alpha + \beta} I = \frac{\alpha\beta}{\alpha + \beta} sY_t \quad (3.4)$$

Thus

$$\frac{dY}{dt} = \sigma s Y_t \text{ and } Y_t = Y_0 e^{\sigma s t} \quad (3.5)$$

where  $\sigma = \frac{\alpha\beta}{\alpha + \beta}$  which corresponds to the output-capital ratio in the Harrod-

Domar model and  $\sigma s$  is the growth rate of income.

The foreign sector is introduced into the analysis to show that export capabilities of developing countries are dependent on the growth of output capacity. Assuming that the maximum export is given by

$$\text{Max. } X_t = \varepsilon Y_t \quad 0 < \varepsilon < 1 \quad (3.6)$$

If  $\varepsilon$  is very small, so that the export earnings are insufficient to import foreign-capital goods, then the growth rate  $\sigma s$  will not be achievable and a trade gap is then said to exist. However, if  $I_f (= \Delta K_f)$  is the level of investment in foreign capital goods required to sustain a growth rate is less than the maximum export earnings, then a bottleneck does not exist. Then from (3.4) it can be derived that

$$\Delta K_f = \frac{1}{\beta} \frac{dY}{dt}$$

$$\text{substituting } I_f \text{ for } \Delta K_f \text{ we get } I_f = \frac{1}{\beta} \frac{dY}{dt} \quad (3.7)$$

and from (3.5)

$$I_f = \frac{1}{\beta} \sigma s Y_t \quad (3.8)$$

Hence to avoid a bottleneck  $I_f < \text{Max. } X_t$  and  $S_t = \text{Max } S_t$  implying that<sup>1</sup>  $\beta\epsilon > \sigma s$ .

With  $\beta\epsilon < \sigma s$  a bottleneck will exist and growth will be constrained by the lower growth rate of  $\beta\epsilon$ . This would imply that a proportion of domestic capital goods will remain idle. To relieve this bottleneck, foreign assistance can be used for the purchase of foreign capital goods. In the case where a savings constraint appears to be dominating, foreign inflows of capital can be utilised to increase total investment in both domestic and foreign capital goods.

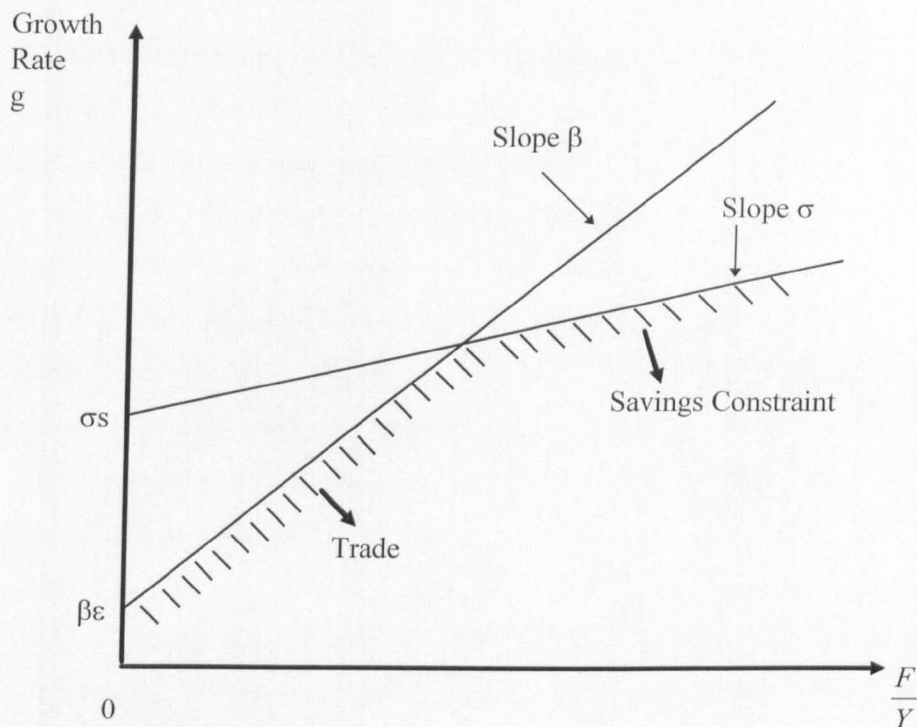
Figure 3.1 illustrates the constraints showing the effects of foreign capital transfer on the growth rate. On the horizontal axis  $\frac{F}{Y}$  is the foreign transfer as a fraction of national income and on the vertical axis  $g$  is the growth rate. The growth rate under each constraint is given by:

$$(i) \ g = \beta\left(\epsilon + \frac{F}{Y}\right) \text{ if } \beta\left(\epsilon + \frac{F}{Y}\right) < \sigma\left(s + \frac{F}{Y}\right) \Rightarrow \text{trade constraint}$$

$$(ii) \ g = \sigma\left(s + \frac{F}{Y}\right) \text{ if } \beta\left(\epsilon + \frac{F}{Y}\right) > \sigma\left(s + \frac{F}{Y}\right) \Rightarrow \text{savings constraint}$$

<sup>1</sup> Given  $X_t = \epsilon Y_t$  which will finance the importation of the capital goods of  $I_f = \epsilon Y_t$ , from (3.7), it can be substituted to yield the growth rate that can be attained with given exports as :

$\frac{dY}{dt} = \beta\epsilon Y_t$  and subsequently,  $Y_t = Y_0 e^{\beta\epsilon t}$ .

**Figure 3.1: The Savings and Foreign Exchange Constraints.**

Under a trade gap, foreign transfers have a proportionately greater impact on the growth rate than if the savings constraint is binding. If an amount of  $F$  flows in as foreign aid, under a savings constraint, income will be increased by  $\frac{\alpha\beta}{\alpha + \beta} F$ , whereas under a trade gap income will increase by  $\beta F$ , which is greater than the former. This can also be depicted graphically from figure 3.1 as the slope of the trade constraint ( $\beta$ ) is greater than the slope of the savings constraint ( $\sigma$ ), hence foreign capital is more productive under a binding foreign exchange regime. For a further graphical representation of the trade and savings gaps using isoquants see Findlay (1973) and White (1992).

**3.4 Chenery and Strout's Dual Gap Model Representation.**

In addition to the savings and trade gaps, Chenery and Strout (1966) identified another factor constraining growth in the early stage of the development process: skills and organisational abilities. This constraint is seen to be binding because to make efficient use of investment in new plant and equipment a well-trained labour force must be in place otherwise in the first instance investment resources should be diverted towards human capital. The skill constraint is an important issue as discussed in the growth models, especially, in endogenous growth models. The model developed by Chenery and Strout is often cited and would be useful to detail it here. Note that they do not explicitly perform the analysis using a production function.

Chenery and Strout argue that without external assistance a country must supply all requirements of accelerated growth from its own resources or from resources available from abroad made possible by the foreign exchange earned by exports. For output to increase requires a “simultaneous increase in skills, domestic savings, and export earnings as well as an allocation of these increased resources in such a way as to satisfy the changing demands resulting from rising levels of income” (pp. 680). Failure of one of these will limit growth so that other factors will be under-utilised. This can be remedied by recourse to foreign assistance in relieving the potential bottlenecks of skills, savings, or foreign exchange. In such a case growth will be higher than that permitted by the most constraining factor by making efficient use of the other resources which were idle in the absence of foreign assistance.

Hence the model developed attempts to incorporate the role of aid in relieving the relevant constraint. They identify four ‘phases’ in which an economy can be located: the first two is where growth and investment are constrained by the absorptive capacity and either sufficient foreign assistance is available but a gap exists between investment ability and savings ability (Phase IA), or the trade

gap is binding (Phase IB), and the second set is when investment and growth are constrained by the target growth rate in which a situation where the savings gap is dominant (Phase II) and Phase III where instead the binding constraint is the trade gap.

The model is outlined as follows:

The notations are as used earlier. The capacity limit takes the Harrod-Domar assumptions that a certain amount of investment is required to increase output, so that:

$$Y_t - Y_0 = \frac{1}{\kappa} \sum I_t \quad (3.9)$$

At low levels of development, growth will be constrained by the ability to invest. It implies that the absorptive capacity of additional investment is limited by some complementary inputs such as skill. The investment function will thus be given by:

$$I_t^{\text{Ski}} = (1 + \Phi) I_{t-1} \quad (3.10)$$

where  $\Phi$  is the maximum rate of growth of investment and the superscript Ski indicates that investment is constrained by the skill factor. In such a case  $\Phi$  is referred as the “skill limit” indicating that skill formation is required in order to increase productive investment. The magnitude of  $\Phi$  describes the rapidity of the learning process. This constraint will be binding until investment<sup>2</sup> reaches  $\kappa r$  (where  $r$  is the targeted rate of growth) and as from then growth will be constrained by the target growth rate with investment defined as:

$$I_t^{\text{Tar}} = \kappa r Y_t \quad (3.11)$$

the superscript Tar indicates that investment is set by the target rate of growth.

The savings function is linearly defined as in the case of Rosenstein-Rodan as:

$$S_t = S_0 + b(Y_t - Y_0) \quad (3.12)$$

---

<sup>2</sup> The abandonment of the ability to invest constraint as the dominant one implies that the country is sufficiently mature technically so that it is now able to absorb all domestic and foreign savings likely to be made available and to channel them into efficient investment outlets.

The actual level of investment will be given by whichever of (3.10) or (3.11) is minimum so that the level of foreign capital inflows which will be required to fill the savings gap will be:

$$\text{either (i) } F_t^{\text{Ski}} = I_t^{\text{Ski}} - S_t \quad \text{if } I_t^{\text{Ski}} < I_t^{\text{Tar}} \quad (3.13A)$$

$$\text{or (ii) } F_t^{\text{Tar}} = I_t^{\text{Tar}} - S_t \quad \text{if } I_t^{\text{Tar}} < I_t^{\text{Ski}} \quad (3.13B)$$

If it is assumed that export earnings are sufficient to cover a certain minimum level of imports which complements domestic production, for example foreign capital goods and intermediate goods which are not available domestically, then under this condition if growth is constrained by the ability to invest, i.e. equation (3.10) is relevant, the situation is described as Phase IA. If, however equation (3.11) is prevalent, then growth will be constrained by the growth target and the economy is said to be in Phase II.

In case exports earnings are not sufficient to meet the minimum import requirements to achieve a certain growth rate, a trade gap is said to exist. To analyse the trade gap the minimum level of imports is set as:

$$M_t = M_0 + \mu(Y_t - Y_0) \quad (3.14)$$

where  $\mu$  is the minimum marginal import ratio so that the level of imports is the minimum required to sustain a given level of income at time  $t$  to achieve the desired level of growth. Exports are assumed to grow at an exogenously given rate  $\varepsilon$ , so that:

$$X_t = (1 + \varepsilon) X_{t-1} \quad (3.15)$$

The level of capital inflows required to fill the gap between import requirement and export earnings at time  $t$  is given by:

$$F_t = M_t - X_t \quad (3.16)$$

Hence the actual amount of foreign capital will depend in which 'Phase' the economy is in. When growth is constrained by the ability to invest, i.e. investment is given by equation (3.10) and the trade gap is larger than the savings gap, foreign inflows will be determined by equation (3.16) with

equation (3.12) made redundant (situation described as Phase IB which according to Chenery and Strout does not seem of great significance empirically). Phase III is described as a situation where investment is set by equation (3.11) and it is the trade gap which is the dominant constraint so that foreign transfers are determined by equation (3.16) with equation (3.12) made redundant, so that less savings are required than specified.

As shown the analysis incorporates the possibility that the two gaps need not necessarily be equal *ex ante* but *ex post* foreign transfers will be given by :

$$F_t = I_t - S_t = M_t - X_t \quad (3.17)$$

This is because *ex ante* the filling of the larger gap also fills the smaller gap so that *ex post* they are equal.

With these four phases described, if the structural parameters are allowed to change at random over time, then any phase can follow each other in any order. With fixed parameters, however, the most likely sequence as argued by Chenery and Strout is from Phase IA, where growth is initially constrained by the ability to invest, during which period the savings gap is more likely to be the larger of the two gaps and hence determine the level of foreign capital. This situation characterises countries in the early stages of the development process. As soon as growth is no more constrained by the ability to invest Phase II sets in, in which growth is set by the target rate  $r$  and foreign capital is required to fill the savings gap. With the rising level of income, the savings rate increases to fill the domestic gap but it is more likely that import growth will exceed that of exports, typically in developing countries, so that the trade gap is larger than the savings gap and the economy will be in Phase III. This transition from Phase II to Phase III occurs when the deficiency in the flexibility of the economy's production structure becomes more of a bottleneck than the deficiency in its saving capacity.

The amount of capital flowing in will depend on which phase is predominant.

The following sets the amount which will be required in each phase:

**PHASE IA:** Growth is constrained by the ability to invest given by  $I_t^{ski}$ , and equations (3.10) and (3.12) are substituted into (3.13A) to describe that the savings gap is dominant. Foreign capital inflow is then given by :

$$F_t = (1 + \Phi)^t I_0 - [S_0 + b(Y_t - Y_0)] \quad (3.18)$$

In this phase  $Y_t = \frac{I_t}{\Phi \kappa}$  because  $\Phi$  is the target growth rate. Hence,

$$F_t = (1 + \Phi)^t I_0 - S_0 - b \frac{I_t}{\Phi \kappa} + b \frac{I_0}{\Phi \kappa} \quad (3.19)$$

Aggregate capital inflow in this phase will be given as:

$$\sum_0^T F_t = I_0 \left[ \frac{(1 + \Phi)^{T+1} - 1}{\Phi} \right] \left( 1 - \frac{b}{\Phi \kappa} \right) - (T+1) \left( S_0 - b \frac{I_0}{\Phi \kappa} \right) \quad (3.20)$$

**PHASE IB:** Growth is constrained by the ability to invest (equation (3.10)) and equations (3.14) and (3.15) are substituted into equation (3.16) to give the trade gap. The foreign capital inflow in year t is given by :

$$F_t = M_0 + \mu(Y_t - Y_0) - (1 + \varepsilon)^t X_0 \quad (3.21)$$

substituting for  $Y_t = \frac{I_t}{\Phi \kappa}$

$$F_t = M_0 + \mu \frac{I_t}{\Phi \kappa} - \mu \frac{I_0}{\Phi \kappa} - (1 + \varepsilon)^t X_0 \quad (3.22)$$

Aggregate capital inflow during this phase will be

$$\sum_0^T F_t = (T+1) \left( M_0 - \mu \frac{I_0}{\Phi \kappa} \right) + \mu \frac{I_0}{\Phi \kappa} \left[ \frac{(1 + \Phi)^{T+1} - 1}{\Phi} \right] - X_0 \left[ \frac{(1 + \varepsilon)^{T+1} - 1}{\varepsilon} \right] \quad (3.23)$$

**PHASE II:** Growth is constrained by the target rate of growth and equations (3.11) and (3.12) are substituted into equation (3.13B) to give the savings gap.

Given  $Y_t = (1+r) Y_{t-1}$ , it can be rewritten as  $Y_t = Y_0 (1+r)^t$

and from (3.11),  $I_t = \kappa r Y_t$  becomes  $I_t = Y_0 \kappa r (1+r)^t$ . Hence, the foreign capital inflow in year t is then:



$$F_t = Y_0 \kappa r (1+r)^t - S_0 - bY_t - bY_0$$

$$F_t = Y_0 \kappa r (1+r)^t - S_0 - bY_0 (1+r)^t - bY_0 \quad (3.24)$$

Aggregate capital inflow during this phase will be:

$$\sum_0^T F_t = Y_0 \left[ (1+r)^{T+1} - 1 \right] \left( \kappa - \frac{b}{r} \right) - (T+1) (S_0 - bY_0) \quad (3.25)$$

**PHASE III:** Growth is constrained by the target rate of growth and equations (3.14) and (3.15) are substituted into equation (3.16) to give the trade gap. The foreign capital inflow in year  $t$  is given by :

$$F_t = M_0 + \mu(Y_t - Y_0) - (1 + \varepsilon)^t X_0$$

and aggregate capital inflow with the target growth rate will be:

$$\begin{aligned} \sum_0^T F_t = & \frac{Y_0 \mu}{r} \left[ (1+r)^{T+1} - 1 \right] - X_0 \left[ \frac{(1+r)^{T+1} - 1}{r} \right] + \\ & (T+1) \left[ M_0 + Y_0 \mu \right] \end{aligned} \quad (3.26)$$

Having found the amount of foreign aid under each constraint we now assess the productivity of aid in the next section when either savings or foreign exchange gap is the relevant gap.

### 3.5 The Productivity of Aid.

It was seen from Mckinnon's analysis that the productivity of foreign transfers on growth is higher under a balance of payments constraint than when growth is savings limited. To see the result in the Chenery and Strout model the productivity of an increase in foreign capital can be measured by the corresponding increase in total income. With the target growth rate  $r$ , the productivity of foreign capital inflow can be derived by differentiating equations (3.25) and (3.26). Under a savings constraint, the productivity is given by:

$$\frac{d(Y_{t+1})}{d\left(\sum_0^T F_t\right)} = \frac{1}{\kappa - b\tau} \quad (3.27)$$

and for the trade gap:

$$\frac{d(Y_{t+1})}{d(\sum_0^T F_t)} = \frac{1}{\mu\tau} \quad (3.28)$$

where  $\tau = \{ [T - (1 - (1+r)^{-1})/r] / r(T+1) \}$ .

Comparing (3.27) with (3.28), it can be deduced that foreign assistance will be more productive in Phase III than if the economy is in Phase II. The results are akin to those in McKinnon as elaborated earlier. The simple reason to observe this higher effect in Phase II is that the available productive capacity is not being fully utilised as there are redundant domestic resources. With more foreign exchange made available through external assistance, complementary foreign capital goods or raw materials are supplied to enable the redundant resources to be brought into use. The impact of foreign capital on growth rates will be much greater under the trade constraint if foreign capital-goods requirements are small, i.e. a small  $\mu$ .

### **3.6 Empirical Findings using the Gap Model**

Numerous country-case studies have been carried out. We review some of them here. As mentioned earlier the pioneering exercise of aid requirements for underdeveloped countries was carried out by Rosenstein-Rodan (1961) where 'international aid' would fill the savings gap to achieve self-sustaining growth. His sample covered all the underdeveloped countries in Africa, Latin America, Asia, Europe and Middle East. Assuming a capital-output ratio of 3:1 throughout, countries in Africa appeared to be far from reaching a sustained growth path while some countries in Latin America had already reached such a stage in the 1960s. In the case study of Israel by Chenery and Bruno (1962), the role of foreign capital inflows was to add to both investment and foreign exchange resources. Based on a policy model encompassing typical country objectives, instruments and structural limitations, they analysed the main

development alternatives in Israel and showed the interrelations among the main instruments of development policy. With some estimates of the parameters in the model for the planning period 1959/60 to 1964/5, they elaborated on the range of feasible combinations of instrument variables that can be considered by a policy maker. For controlled variables (exchange rate, foreign capital inflow, growth in labour productivity, unemployment level and government current expenditure) they assumed three levels of values: a minimum, representing a pessimistic assessment of the future possibilities; an intermediate value based on past trends; and a maximum or most optimistic value.

They concluded that the key difficulties were to increase exports and to adjust to the changed composition of domestic demand to achieve the maximum increase in GNP with an intermediate value of capital inflow. They suggested that with higher capital inflow and with less serious changes in the composition of output, a higher productivity limit could be reached. From the estimates calculated with plausible values of the parameters (capital-output ratio, marginal propensity to save, effective exchange rate, etc.) the productivity of aid ranged from 0.2 to 0.6 when domestic savings was the limit to growth and from 0.4 to over 1.0 when trade was the binding constraint. They argued that countries with high capital-output ratios, low savings and high import propensities are bound to experience low productivity of aid.

A similar exercise was carried out by Adelman and Chenery (1966) in the case of Greece. Greece's dependence on external assistance was high in the years 1945-60, but during the period 1950-61 its dependence was reduced by more than 50% while a real growth rate of 6% was maintained. For the requirements of the six per cent growth, the analysis suggested that up to 1957 the main function of external assistance was to relieve a savings constraint, while, since then, the import-export gap has become increasingly dominant. They used a general equilibrium system where the most important elements were the

structural determinants of imports and investment, the tax and savings functions, and factors affecting exports. Comparing predicted values of the endogenous variables with the values actually observed indicated the descriptive validity of the econometric model. The estimates reproduced values which were similar to historical values. The model was then used to investigate the effect of the external capital inflow and to project the future evolution of the Greek economy under varying conditions.

The tendency for the savings gap to decline while the balance of payments gap rises indicated that new investment had not been sufficiently directed into sectors that earn or save foreign exchange. It was projected that in 1970 the level of domestic saving would be enough to generate a growth rate of 6% with a capital-output ratio of 3. However, import requirements would have to be reduced or export growth increased and additional savings needed to be transformed into productive investment. They concluded that the problem in the case of Greece has been of allocating investment rather than of domestic finance for investment.

Chenery and Strout's (1966) gap projections in the case of Pakistan was based on two assumptions: one pessimistic and one optimistic, where in the latter the growth rate, the savings rate and the growth of exports were higher than in the former. Projections under the two assumptions gave the following sequence of phases:

	under the pessimistic assumption	under the optimistic assumption
Phase IA	1963	1963-67
Phase II	1964-67	1968-73
Phase III	1968-	1974-
End of Transition	After 1985	After 1979

Source: Table 4 in Chenery and Strout (1966).

It has been observed that investment from 1956 to 1964 has grown very rapidly and doubled its share in GNP. The growth rate of output has increased from two per cent prior to 1958 to over four per cent since 1960. Under the optimistic assumption, it took ten years of steadily rising investment from the 7 per cent level of 1956 to reach 18 per cent of GNP required by a growth rate of 6 per cent. Capital inflow would reach a maximum of 6 per cent of GNP in 1967. Assuming a savings constraint, the capital inflow could then be reduced to zero in 1980 if the marginal savings rate was maintained at 0.24. But even with a 7 per cent growth of exports per year and a marginal import requirement of 0.10 would switch the economy into Phase III in 1974. A similar pattern was observed in the projections for the majority of the 50 developing countries which they further analysed.

In measuring the productivity of aid for the case of Pakistan under the savings and the balance of payments constraints, assuming a target growth rate of 5 per cent for a period of 14 years, gave a value of 0.44 under the savings constraint and 1.14 when the latter was binding. These supported the theoretical derivation that foreign assistance is more productive under a trade constraint than under a savings constraint.

With historical data it is indeed very difficult to assess which constraint was in fact binding for a particular country because *ex post* both gaps are equal. Given such difficulty Weisskopf (1972) developed and applied an econometric method that could help for such a classification. The dependent variable in his regressions was investment and the independent variables were a combination of gross domestic product (Y), net foreign capital inflow (F), exports (X) or imports (M) depending on which constraint is tested. For instance, for a case of a pure savings constraint, investment is regressed on Y, F and X. The results would then depend on the numerical values of the estimated coefficients which are checked for consistency with some range deemed appropriate on a priori

grounds. For the savings constraint, the Y and X coefficients must be non-negative and the F coefficient less than or equal to one.

The test was applied to a sample of 44 underdeveloped countries over the post-war period. The results showed that 23 countries appeared to have been subject primarily to a savings constraint on growth and 8 were apparently dominated by a trade constraint. Six countries were classified as being inconsistent with both a pure savings and a pure trade constraint implying that they were characterised by a hybrid of savings-and-trade constraint. Seven countries were classified as 'unclassifiable' due to unavailability of data. He concluded that the importance attributed to the trade constraint was questionable as being a limit on growth and that "a binding trade constraint on growth has been a relatively infrequent phenomenon in the post-war experience of the underdeveloped countries" (pp. 77). Weisskopf's results should be interpreted with much care, especially where most LDCs are witnessing a widening balance of payments deficit. This is because the estimated coefficients might be subject to biasedness and inconsistency due to the limited amount of observations (for e.g. 11 countries had only 7 observations and in most cases around 14 observations were available). Hence the tests suffered from a lack of degrees of freedom.

### **3.7 Some Criticisms of Two Gap Models.**

The two gap model is very useful for policy makers in forecasting the volume of foreign capital inflows necessary to achieve a target rate of growth depending which of the two constraints is relevant. But the model has been subject to major criticisms over past decades mainly because of the assumptions on which it is based on, and empirically, its predictability has been limited.

All of the theories so far reviewed have optimistically assumed that the recipient countries would adjust their economic structures so that foreign assistance is efficiently and productively used towards the achievement of self-sustaining growth. However, these assumptions were seriously questioned in the 1970s and 1980s for many developing countries despite massive capital inflows, development and growth were not occurring as expected. The structural changes which Chenery and collaborators predicted to take place with external assistance did not automatically occur. The domestic production structure hardly changed despite changes in the resource allocation and the poor developing countries still continue to rely on traditional commodities. This as a result led to an unstable export growth (contrary to the exogenous export growth assumption in the models described). External market demands were unfavourable for these primary commodities for many obvious reasons in the developed economies. These could be explained by the shift of industrial production in advanced countries from low-technology, material-intensive goods to high-technology, skill-intensive products; increased efficiency in industrial uses of material inputs; substitution of synthetics for natural raw materials; low income elasticity of demand for many agricultural commodities and simple manufactures in which low-income countries have a comparative advantage; the rising productivity of agriculture in developing countries; and the protection of agriculture and labour-intensive industries in advanced countries. Hence it was not surprising that these were reflected in a large and growing balance of payments deficit.

The failure of the gap model appears to lie on the assumptions upon which it is based. For example, about the zero substitution assumption between inputs, Chenery and Bruno (1962) recognised that substitution between labour and capital take place over a period of time and depends to a large extent on the installation of new equipment, but assumed that these inputs are required in fixed proportions at any moment. Chenery and Strout (1966) in turn justified the assumption of a fixed capital-output function 'as a matter of convenience' since production function estimates are 'inconclusive because of the limited data available'.

Luxton (1979) criticised Chenery and Strout model especially when they employed the parameters to estimate the saving gap and the foreign exchange gap. He argued that the results relied on the size of the parameters, such as the propensity to save and import and the incremental capital-output ratio which are estimated from past historical data and which are then assumed to be constant for prediction purposes. What this constancy pre-supposes is a lack of substitutability between consumption and savings and between domestic and imported resources. However, Luxton gave some examples where government policy may be able to affect the propensity to save by developing financial institutions capable of encouraging savings and through a policy of attractive interest rates. For instance, in Mexico where the government--owned development bank, issued bonds which increased savings; in Philippines in 1966, a great and unexpected success resulted from the establishment of a market for Treasury Bills and other short term assets. These examples show that the assumed constancy of the propensity to save in the Chenery and Strout model can be misleading.

Luxton also added that import requirements are not likely be the same in all industries. If there is concentration on sectors where the import requirement is the lowest, the aggregate import coefficient for the whole economy may be



reduced. In such a case a saving constraint is more likely to be the relevant constraint. Whereas if concentration is in sectors with high import requirement, a foreign exchange is more likely to be constraining growth while in practice it is not. The only way that is suggested to resolve this problem is to regard the parameters of the system not as constraints, but as upper or lower limits, basing predictions upon various values for the parameters.

Fei and Ranis (1968) argued that the two gap model as being 'far from satisfactory to date'. They argued that in the Chenery and Strout model the causal order of the phases hardly exist in the real world and that donors do not use the criteria of filling the larger of the two gaps to allocate aid, otherwise recipients would be pleased with higher levels of imports, lower exports, and lower savings. Because donors are *always willing to donate less* than the maximum gap, recipients are forced "to make the unpleasant kind of adjustment in the opposite direction." (pp. 905). On the empirical front, it is argued that the three-phased thesis is not amenable to historical verification even if a particular country has completed all the alleged life cycle. This is because of the fact that the model depicts only a partial picture restricted to the demand for foreign aid. It is seen that there is complete absence of the supply of foreign aid from the model.

Some of the critics also came from Bruton (1969) on the two gap model of Chenery and Strout (1966). His argument tends to point out that foreign aid is "gap producing, not gap covering, and accepting it as the latter can in fact impede, rather than facilitate, development" (pp. 440). To illustrate this he made the assumption that all capital goods are imported and all exports are consumer goods, and that there are no changes inventories of consumer goods or foreign exchange reserves, hence to try to save is to reduce consumption and actually to save is to do that and to export. He showed, by using demand and supply analysis that a two gap situation depends on the assumption of the elasticity of the foreign demand curve. If the elasticity of foreign demand is

elastic and prices fall as domestic demand falls, the rate of capital formation will rise with an increase in the savings rate, but become increasingly costly. A stage will be reached where domestic demand becomes inelastic and further increase in savings will not increase investment. If the target rate of growth requires a higher growth rate of capital than is actually permitted, a trade gap is then said to exist. The problem arises when the supply side is in a heavily protected domestic market where domestic producers are unwilling to export at all and survive only because they are protected from foreign competition.

Bruton further argued that if the domestic capital goods sectors were large enough, savings could be transformed into physical capital necessary to produce the targeted rate of growth of output. If the capital goods sectors expand when aid is flowing in, then in subsequent periods the two gap problem will not emerge. The question is why the capital goods sector does not expand in these developing countries? One of the reasons is that policy makers select sectors in which they have the least comparative disadvantages and apparently consumer durables mostly fall in these categories. Hence these countries use foreign aid to import capital goods to produce a new line of products which the country cannot export and which cannot be used to produce capital goods. A situation like this cannot be treated as a foreign exchange constraint, "but rather that the country was too poor to support its own development" (pp. 445). Hence this is considered as a saving problem not a trade gap problem.

Other criticisms have emerged in trying to refine the two gap model in terms of theory and on empirical grounds. The critiques by Fei and Ranis (1968), Bruton (1969) and others have all related their arguments, in one way or the other, to a specific variable: income growth. Ahmad (1990) mentioned that the studies on the two gap theory concentrates on how foreign capital inflows remove the binding constraints and how it impinges on the output growth of the developing countries. The impact of foreign assistance affects a range of other strategic variables which affect economic growth and development which is not captured

by the two gap analysis. Changes in strategic variables such as exports, imports, domestic savings and so on are affected when there is an inflow of foreign capital, these in turn affect output growth.

It is argued in the two gap model that the role of foreign capital inflows is to supplement domestic saving, but there are many cases in the developing world where instead foreign assistance takes the form of substituting domestic saving (see Griffin (1970)) or when foreign aid is used to finance imports of consumer goods due to starvation, emergency relief, etc. Hence whether foreign capital inflow is used only to finance investment as modelled in the dual gap theory becomes questionable.

Another criticism is that all dual gap models lay too much emphasis on capital accumulation. In fact, they rely heavily on the Harrod-Domar framework, incorporating some modifications. The Harrod-Domar growth model it should be remembered was concerned to deal with problems of labour shortages in the advanced countries. The prime intention was to explore the conditions for stable economic growth in developed countries. Apparently, this might be one of the reasons why these models fail to suit the developing countries and to explain the deteriorating situation of these countries. There are other factors besides capital which also affect growth in these countries for example, the types of goods produced, entrepreneurial qualities, land, and other factor inputs together with the different structure of policies pursued in the particular country. Recent growth models (the so-called endogenous growth models as discussed earlier) have emphasised the role played by human capital in fostering growth. An understanding of these models would most probably better explain the growth performance of developing countries. This would hence enable a new dimension to formulate and reorganise the way foreign capital is expected to meet certain growth target.

Concerning the estimation techniques, most studies have used econometric methods relying mainly on single equation method using the Ordinary Least Squares (OLS). From what is seen above the interdependence between the growth process, production structure, the effect of foreign capital on exports, imports, savings which also have impact on growth will yield biased and inconsistent estimates if OLS is applied. In this context, Over (1975) and Ahmad (1990) have used the simultaneous equation method to account for the interdependence among the variables. the advantage of this technique (using 2SLS and 3SLS) is that both direct and indirect effects of a variable is taken into consideration.

### **3.8 Which is the relevant gap, savings or foreign exchange?**

We have seen that when in an economy the rate of investment is determined by its willingness and ability to mobilise savings, there is said to exist a savings constraint. However, in most of the developing countries the willingness to save, though it exists, is frustrated by the inability to acquire through trade the imports which are required to produce investment goods; the foreign exchange constraint. Joshi's (1970) criticism of these two gap models is that they throw doubt on the use of the constraints, especially that of the foreign exchange constraint. He pointed out that the foreign exchange gap does not enable an increase in export growth and/or a reduction in imports although savings potentials have not been exhausted. If, however, these changes were permissible, the excess of the foreign exchange gap over the savings gap could be reduced and possibly eliminated. The foreign exchange constraint therefore occurs because export growth and import requirements are exogenously determined and cannot be influenced by the policy makers. Thus for the LDCs most of the time the foreign exchange constraint appears to be the most relevant constraint on economic growth rather than the saving constraint.

Similarly assuming that import requirements are inflexible is not true at all levels. Joshi suggested that “whatever the truth may be about the flexibility of techniques in producing a given pattern of output, there can be no doubt that import requirements can be changed by changing the pattern of output. This point is often lost sight of if the imports consist almost entirely of ‘essential’ capital goods and raw materials. But it does not follow that the industries into which they flow are themselves ‘essential’ for growth”. (1970, pp. 124). This could be a case where the imports are flowing into consumption goods industries. In such a case investment can be increased by reducing consumption and diverting the resources towards investment. In case this cannot happen, then a saving constraint describes the situation rather than the trade constraint. He also explained in his analysis that if both consumption and investment enter into the planner’s utility function and if it is assumed that the marginal utility of consumption to the planner is always positive, then a foreign exchange constraint would never exist.

Hence from the above it can be deduced that the gap models presented so far do not enable changes in domestic policies and government intervention to influence the productive structure. Foreign exchange constraint in developing countries can be thought instead to be the result of unstructured industrialisation, haphazard production ventures without any cost advantage judgements and poor sales and marketing strategies unabling them to penetrate new market outlets.

Luxton (1979) has shown that despite the shortage of foreign exchange, if savings could be increased, the amount of investment goods produced in the economy could be raised even though domestic capacity is still under-utilised. He argued that if his approach is found valid in describing the situation facing many less developing countries, then internal measures to raise savings levels may be of great importance. The point made by Luxton is quite instructive to policy makers in LDCs that efforts should be made to increase domestic

savings. In fact Findlay's (1973) analysis of two gap model also suggests that increases in savings always enable an increase in growth. This is further detailed below.

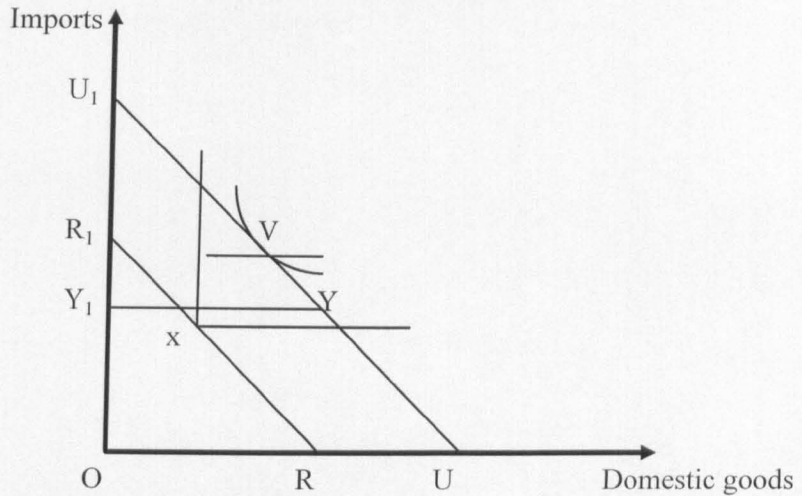
Findlay (1973) also presented an interesting methodology using trade theory in approaching the gap problem. He demonstrated that both the terms of trade and the rate of growth are determined by the marginal propensity to save. Under these circumstances, no trade gap can emerge and increases in savings always enable an increase in the growth rate. This is shown with the use of a simple model in which a country produces a single commodity, which can be used for consumption, investment or export. The model also allows consumption of the imported good. The only factor of production for the domestic output is capital.

In figure 3.2,  $OU$  represents the maximum level of domestic production and  $UU_1$  the budget constraint for the economy as a whole. The slope of  $UU_1$  determines the terms of trade, for example  $OU$  of domestic output can be exported to obtain  $OU_1$  of imported goods at this rate. With given marginal propensity to save, the line  $RR_1$  indicates the resources available for investment. The point  $x$ , where the family of L-shaped isoquant is tangential to the line  $RR_1$ , determines the imported and domestic inputs into investment, and also serves as the origin for a family of consumption indifference curves. The point  $V$  represents the consumption equilibrium point for the economy as a whole in the absence of any constraint on trade.

Now assume that there is a restriction on trade so that  $OUII_1$ , instead of  $OUU_1$ , becomes the feasible set. As illustrated here, it would be possible to maintain the level of investment if consumption now occurs at  $Y$  instead of  $V$ , where consumption bears the burden of the reduced opportunities available. But  $Y$  could also fall below the horizontal isoquant so that reducing consumption is not sufficient to allow the desired consumption to be maintained. Hence it

would appear that a trade gap may still persist even when final consumption of imports is permitted.

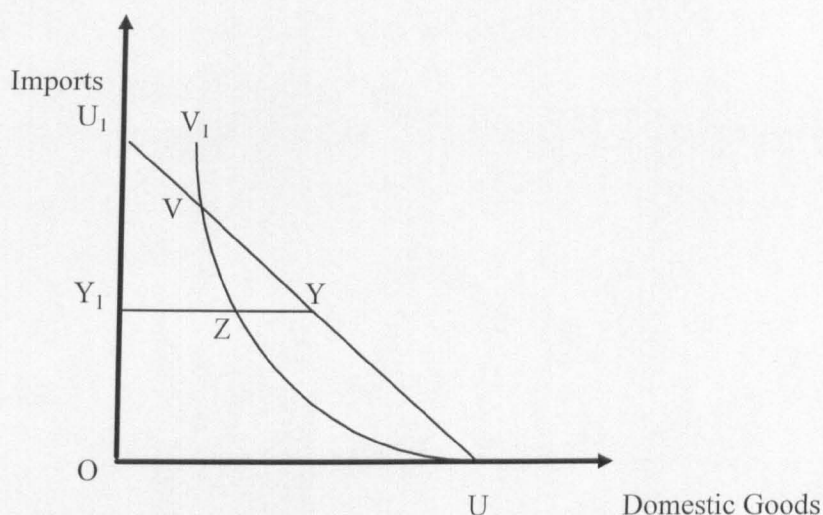
**Figure 3.2: Findlay's gap model representation.**



However, this conclusion requires some clarifications. First of all on the trade restriction. If the limitation is caused by distortions in the domestic trade policies then these should be removed, for instance as in the case of India (Joshi, 1970) where government subsidised industries with negative value added thereby reducing the availability of foreign exchange. To present a genuine case for aid, the restriction must be one that is beyond the control of the domestic authorities. Assuming that the terms of trade is fixed up to the point  $Y$  but beyond that exports has unitary elasticity, then in such a case,  $UY Y_1$  becomes the foreign offer curve as in figure 3.3. The equilibrium terms of trade and export-import volumes can be determined by constructing a domestic offer curve to match against the foreign offer curve  $UY Y_1$ . The terms of trade can be varied by rotating  $UU_1$  on  $U$ . Given the propensity to save, we can obtain the resources available for investment at each value of the terms of trade by rotating  $RR_1$  about  $R$ , parallel to the rotation of  $UU_1$  about  $U$ . At each value of the terms of trade the tangency of the investment isoquants with  $RR_1$  will give the imported and domestic inputs required for investment as well as the origin for placing consumption-indifference map to determine the overall pattern demand

for imported and domestic goods by tangency with the parallel  $UU_1$ . The locus of all these points form the domestic offer curve  $UVV_1$  in figure 3.3 (Findlay, 1973, pp. 194).

**Figure 3.3: The Foreign Offer Curve**



The equilibrium terms of trade will be measured by the slope of  $UZ$  where  $Z$  is the point of intersection of the foreign and domestic offer curves. Moving along the offer curve from  $U$  to  $V_1$  implies higher growth rates since savings are the same but more favourable terms of trade allows a higher value of capital imports. Hence growth would have been higher at  $V$  (without trade restriction) than it is at  $Z$ . But point  $V$  is 'irrelevant' to the country because it would have been the equilibrium point had it been assumed that any desired volume of trade can take place at terms of trade equal to the slope  $UU_1$ . "The foreign exchange gap analysis starts by calculating foreign exchange required at too favourable terms and thus arrives at a gap by deducting foreign exchange actually available" (Ibid., pp. 194). At  $Z$ , the demand and supply of foreign exchange are equal and there is no trade gap.

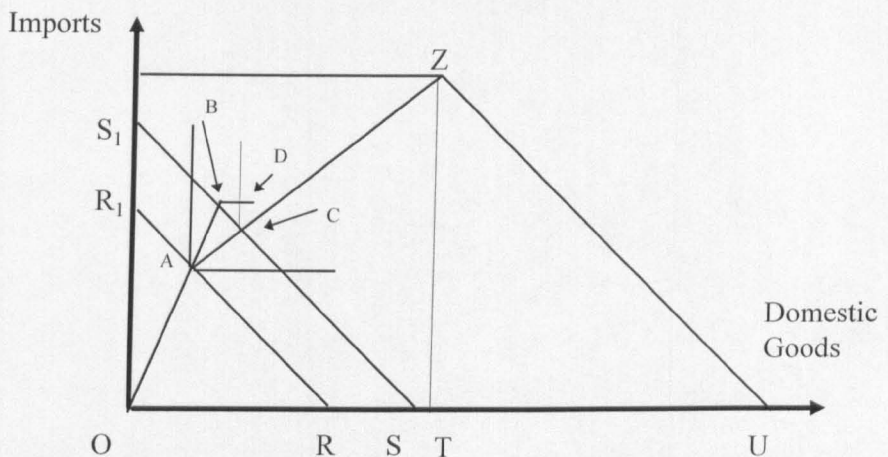
Now, can higher growth rates be achieved without opening a trade gap? Indeed, this can happen by increases in the propensity to save which lead to changes in



the terms of trade preventing the gap to open. This is illustrated in a free trade case in figure 3.4.

UT and ZT are the volumes of exports and imports respectively and the slope UZ measures the terms of trade in free trade equilibrium.  $RR_1$  is the investment budget constraint, based on this equilibrium terms of trade, with investment equilibrium at A. Taking Z as the origin for the consumption problems means that consumption equilibrium is also at A.

**Figure 3.4: The Impact of an Increase in the Marginal Propensity to Save.**



Suppose that there is an increase in the propensity to save such that the investment budget constraint is shifted from  $RR_1$  to  $SS_1$ . The investment equilibrium point shifts to B and consumption equilibrium point to C, which results in an excess demand for imports of CD and an excess supply of domestic goods of BD. To restore equilibrium the terms of trade move against the country, so that  $SS_1$  swing to the left with point S remaining fixed. investment will fall below the level attained at B. The adverse shift in the terms of trade will lead to a fall in the demand of imported consumption goods and the new equilibrium position must be somewhere on OAB above the point C. But since C is already above A, this implies an increase in the level of capital imports. Hence increased savings have allowed higher capital imports and higher growth, and this mainly because the marginal propensity to save determines both the terms of trade and the rate of growth.

The analysis shows that no foreign exchange gap appeared since the relative prices of domestic and foreign goods adjust to clear any disequilibrium in the foreign exchange market. Thus the assertion that relative price adjustment cannot alleviate a foreign exchange gap and that the only solution is the provision of the requisite amount of foreign aid has been questioned. The point made by Findlay, Joshi and Luxton is that a foreign exchange constraint arises mainly because of unduly restrictive assumptions about the structural characteristics of the recipient economy.

### **3.9 Summary and Conclusion.**

This chapter has shown that there are other factors which also constrain growth. Among the main factors, foreign exchange was seen to be constraining growth in many developing countries. Relieving a foreign exchange gap has more growth potential than relieving a savings gap. The two gap model has receiving many criticisms due to the assumptions on which it is based and its predictive value. Some authors have rejected the claim that a 'pure' foreign exchange gap can exist. If it exists, it is due to structural rigidities, unstructured industrialisation, haphazard production ventures without any cost advantage judgements and poor sales and marketing strategies. They have pointed out that policies aimed at increasing savings will enable increases in growth.

In this context we use growth models which include savings a determinant of economic growth. Before running any econometric analysis, we first analyse the regional capital flows to see which regions have been favoured by which types of capital transfer, and second, we perform some preliminary statistical data analysis to see any association between aid, growth, savings and investment.

# Chapter Four

## Some Preliminary Data Analysis

# **Chapter Four**

## **SOME PRELIMINARY DATA ANALYSIS**

### **4.1 Introduction**

In Chapter 1 aggregate net resource flows were analysed and we noticed that low income countries have relied heavily on foreign aid flows while middle income countries have access to private capital markets. In this chapter we first analyse in section 4.2 the distribution of capital flows by region. This will enable us to detect the types of capital that have been flowing to the regions and will also indicate to us which region has been more favoured in particular capital flows. Before proceeding to our own econometric analysis, it is worthwhile investigating some summary statistics that will be used, for example, growth rates, investment rates, savings rates and the different types of foreign capital inflows, for time period under study. This will help in detecting any trend or pattern among the variables. In this context, section 4.3 provides some preliminary statistics on these macro variables for each region. These will enable us to see how countries in particular region have fared. Section 4.4 concludes the chapter.

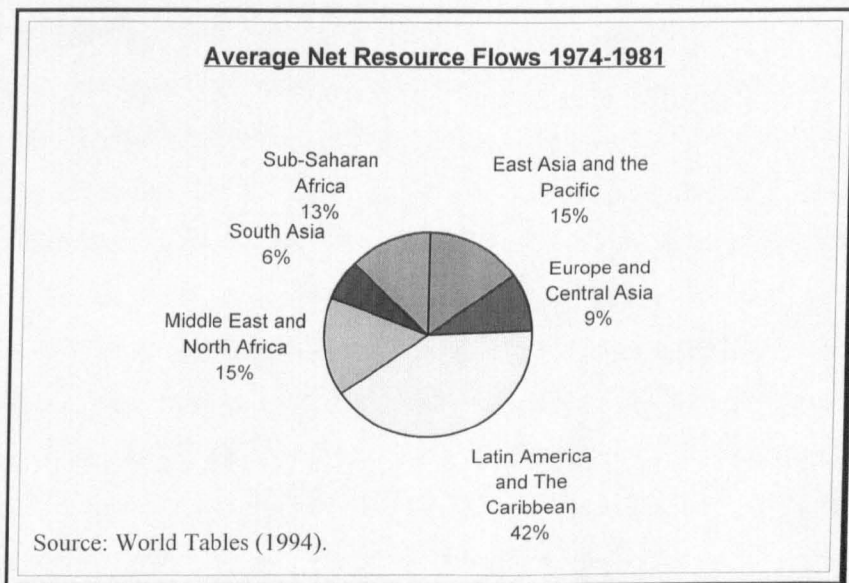
### **4.2 Regional Distribution of Capital Flows.**

This chapter supplements the exercise performed in Chapter 1 where we analysed the trends and sources of net resource flows to developing countries. We now break down the analysis of net resource transfers to concentrate on the geographical distribution of these flows and see whether some regions have been more favoured than others. The geographical distribution entails many essential characteristics which are not present when analysing these flows when classified under different income groups, for instance, historical links, cultures, tradition, colonisation history, climate, location and so on which might affect

the distribution of foreign assistance. The World Bank (World Debt Tables 1994-95) divides developing countries into six regions: East Asia and the Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia, and Sub-Saharan Africa. The same procedure is followed here.

We divide the time period into the three main international events that took place between the period 1970 to 1993, namely the oil price shocks (1974-81), the debt crisis (1982-87) and the trade liberalisation period (1988-93). Figures 4.1, 4.2 and 4.3 depict the three time periods respectively and give an indication of how on average net resource flows have been distributed to developing countries by region. It can be seen that during the oil price shock (figure 4.1), the Latin American and Caribbean countries were the main recipients of net resource flows accounting for around 40%, followed by the East Asian and the Pacific countries accounting around 16% of total net flows.

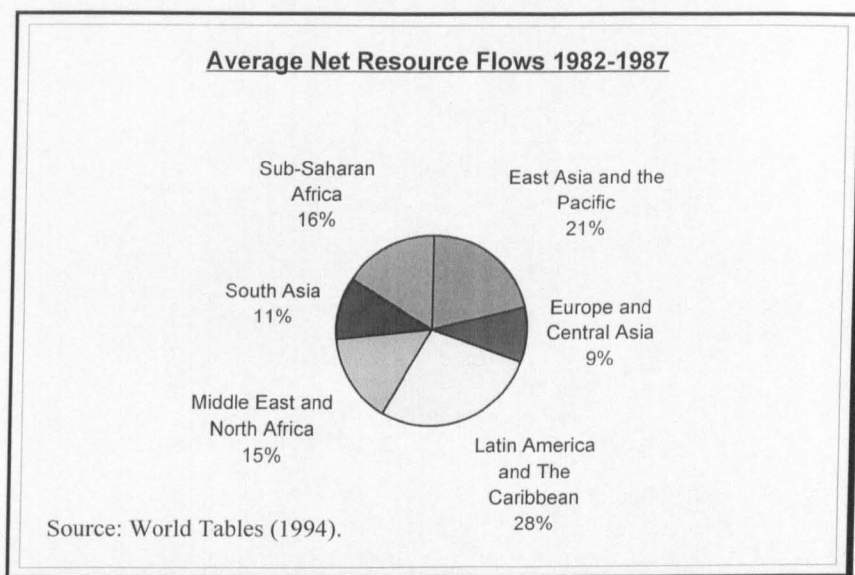
**Figure 4.1: Average Net Resource Flows 1974-1981**



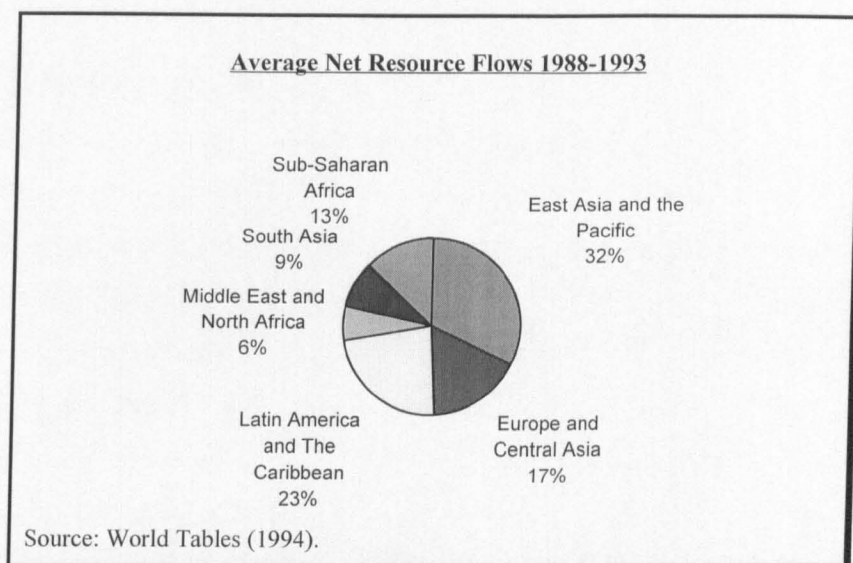
With the onset of the debt crisis which started in the Latin American countries, aggregate net resource flows fell dramatically as can be observed in Figure 4.2. Capital flight was also a prominent feature in those countries. Capital flows,

especially private flows, were directed to other countries and the recipients were the countries in the East Asia and the Pacific.

**Figure 4.2: Average Net Resource Flows 1982-1987.**



During the 1990s, however, East Asian and Pacific countries attracted more net resource flows than Latin American and Caribbean countries. Claims coming from other countries were increasing, for instance from Europe and Central Asia which comprises New Independent States (NIS) from former USSR. It should be noted that Sub-Saharan African and South Asian countries, where most of the low income countries are located, have together accounted for about 18% of total net resource flows in the period 1990-1993 (see figure 4.3) which is quite low compared to other regions when the population of these countries are taken into consideration. From table 4.1 it can be seen that on average, per capita net resource flows for all the regions have increased over the years. However, some regions have been more favoured than others, for instance, in the period 1990-93, for Latin America and the Caribbean per capita net resource flows have more than doubled while for Middle East and North African countries these have fallen by 45%. For South Asian and Sub-Saharan African countries these flows in per capita terms have stabilised at around US \$8 and US \$27 respectively.

**Figure 4.3: Average Net Resource Flows 1988-1993****Table 4.1: Average Per Capita Net Resource Flows (US \$) 1970-93**

Region	1970-1973	1974-1981 (Phase I)	1982-1987 (Phase II)	1988-1993 (Phase II)
East Asia and the Pacific	2.1	6.7	9.3	22.5
Europe and Central Asia	2.6	12.6	13.1	40.1
Latin America and the Caribbean	20.9	72.2	46.5	60.1
Middle East and North Africa	11.9	56.1	47.8	29.7
South Asia	2.0	4.4	7.2	8.7
Sub-Saharan Africa	6.4	21.4	23.7	28.4

Source: computed from World Tables and World Debt Tables.

Although we have seen the aggregate net resource flows for the regions, we would like to know which type of capital has been flowing into these regions. That is we are now interested in the trend and composition of capital flows. It is also interesting to note the main recipient countries in each region and see how on aggregate countries in the region have been affected by the above mentioned international episodes. In this context figures 4.4 to 4.9 depict the net resource flows of these regions for the period 1970-1993. The three major international episodes which have influenced the world economic environment



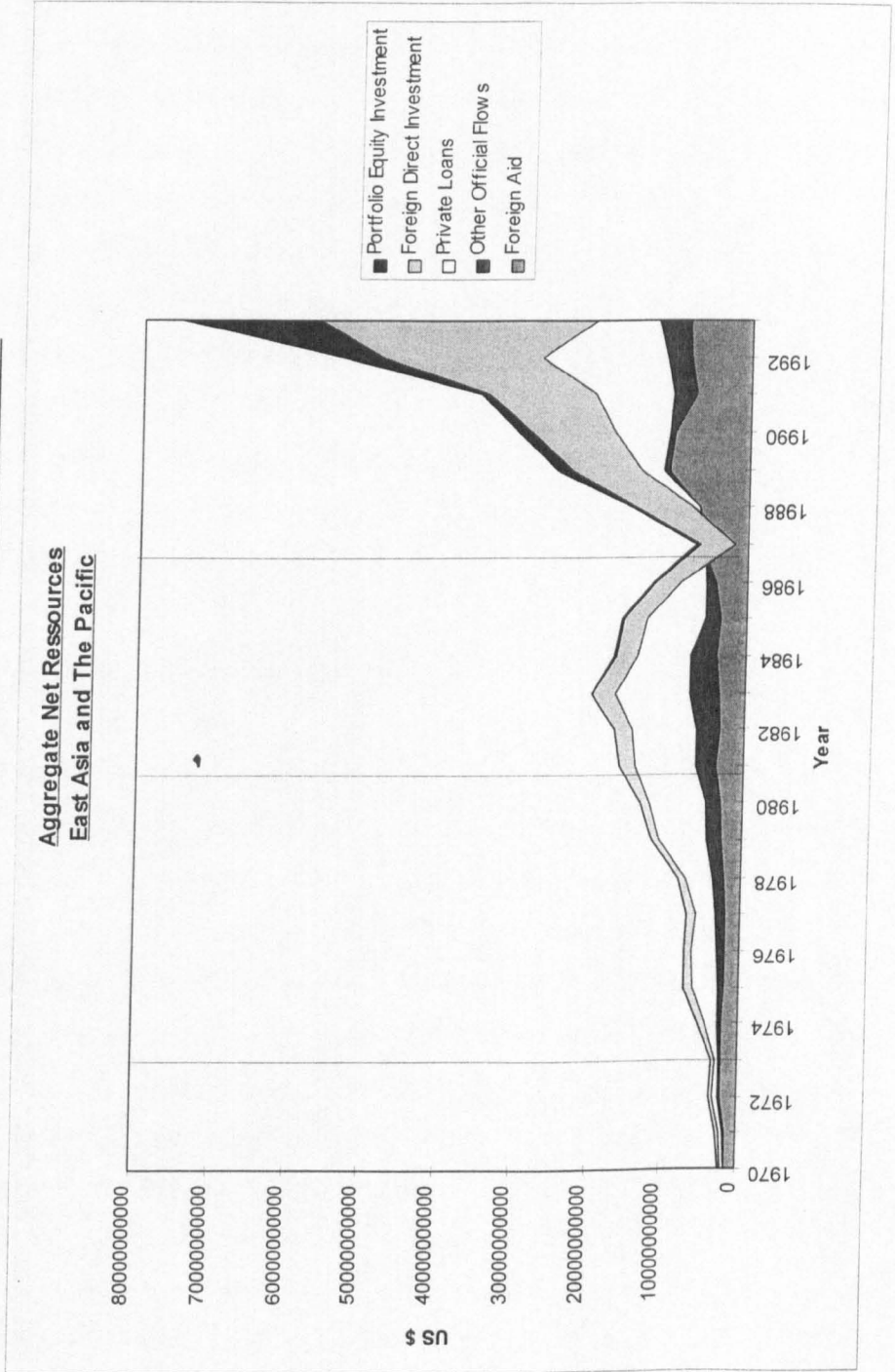
are as described in figure 1.3 and are the two oil price shocks, the international debt crisis, and trade liberalisation. They are labelled as Phase I, II and III respectively.

#### **4.2.1 East Asia and the Pacific**

From figure 4.4 it can be observed that for East Asia and the Pacific in the beginning of the period official development finance (the main component being foreign aid) was more important than private flows, in fact it averaged around 65%. Thereafter, private net flows became a major source of external finance for the countries in this region. Notice that in phase I, it looked like the oil price shocks did not affect the net resources flows. In fact resources were flowing in at a constant rate while countries in other regions required external financing of a larger magnitude. One of the reasons might be the number of middle income countries that are in this region, in fact there are 11 out of 17 and also because of new oil exporters in the region, for example, Malaysia and Indonesia. The debt crisis, phase II, started to hit most countries in this region by 1984 rather than 1982, as in other regions. Capital flows were falling due to an apparent weakening of private sector confidence, related in particular to wide swings in exchange rates and uncertainty about their future evolution. Capital flight became significant in 1987 where a net outflow of private loans was noticed. Although other official flows were stable (declining slightly during 1985-87), it was private flows which fell drastically, especially in the form of private loans when real interest rates were very high. Thereafter with trade liberalisation, there has been a massive inflow of net resources mainly in the form of foreign direct investment. In this region there are 4 countries out of 17 which are the main recipients, they are China, Indonesia, Republic of Korea, and Malaysia. Together they have accounted of total net resource flows of around 65% in 1980, over 85% in 1992 and 1993. Private flows to these countries have become very important, especially in terms of foreign direct



Figure 4.4 : Aggregate Net Resource Flows to East Asia and the Pacific US \$ 1970-93.

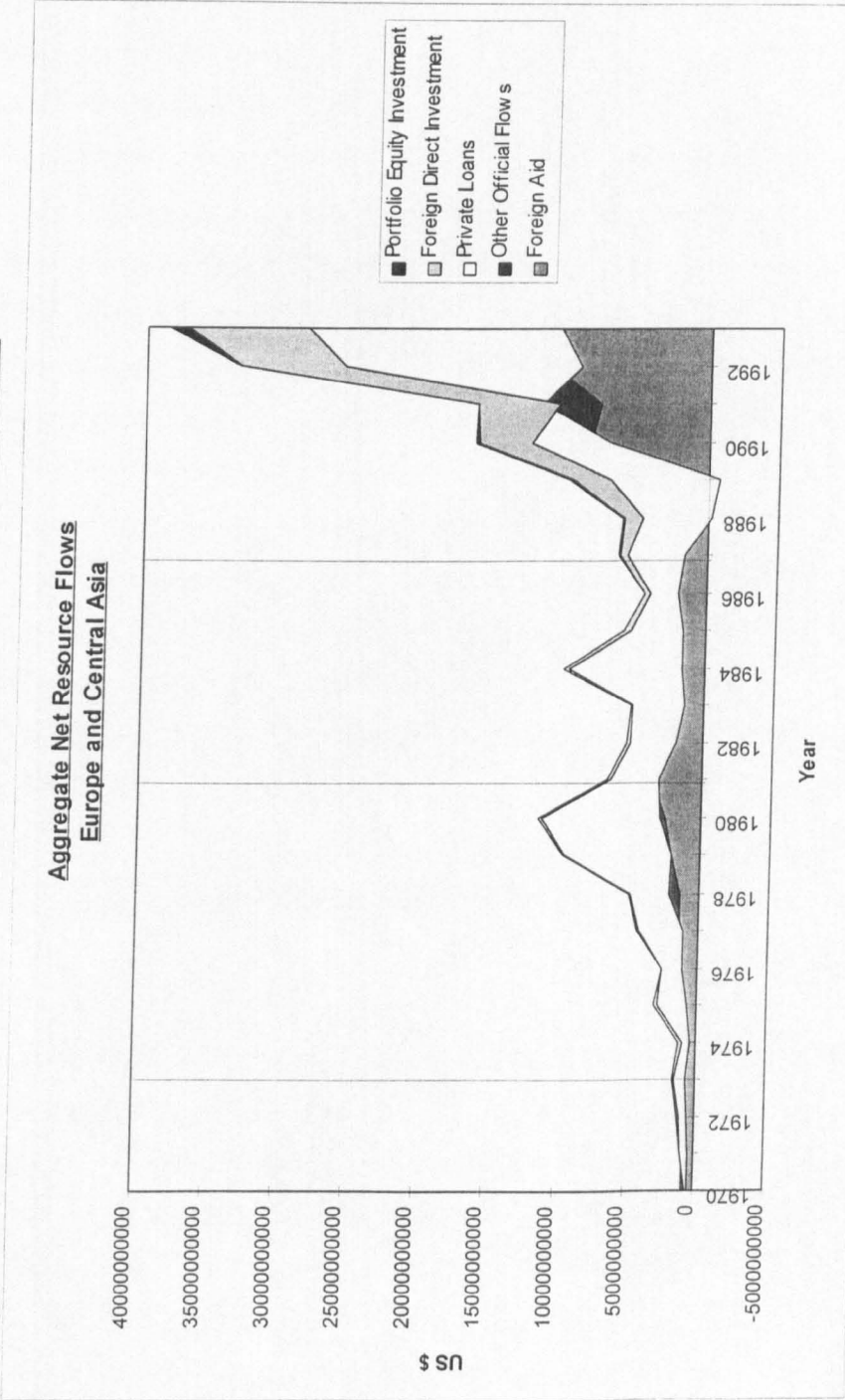


investment (FDI). The main recipient of foreign direct investment is China. In fact China's share has been increasing dramatically in the 1990s accounting for about 72% of all FDI flows in that region (World Bank, 1992). Not only that, it has become the largest recipient of FDI flows in the world. This is because China's political ascendancy in the early part of 1992 of reformers favouring market-based reforms to accelerate economic expansion. Economic reforms included the large-scale removal of price controls, the opening of more cities to foreign investment and the granting of more autonomy to provincial government. This favourable political climate helped the surge in foreign investment. Other countries receiving FDI flows are Malaysia, 12%, Thailand, 7%, and Indonesia, 5% of total FDI flows in that region. The countries in this region have recently experienced greater market access to private capital flows. The share of official development finance has been only 14% of aggregate net resource flows to the region in 1993.

#### **4.2.2 Europe and Central Asia**

In the case of Europe and Central Asia (see figure 4.5) official flows were not the major source of net resource flows in relative or absolute terms until the 1990s where there has been an increase in absolute terms. This increase was in both official loans and official grants which were directed mainly to the New Independent States (NIS) which were part of former Russia and Yugoslavia. The second price shock has necessitated a large amount of private capital loans but soon with the debt crisis, these started to dry up as real interest rates were on the rise. During the 1970s and 1980s the main recipients of net resource flows were Turkey and the former Yugoslavia. For the latter, there was a net inflow of resource up to 1982 and since then there has been a continuous outflow mainly because of the political conflict in that country. But in 1993 resources have been flowing in again. The post 1989 dramatic economic and political reforms had surfaced in a number of Eastern European countries and in the USSR were driven in part by the failure of the then existing system,

Figure 4.5 :Aggregate Net Resource Flows to Europe and Central Asia US \$ 1970-93.

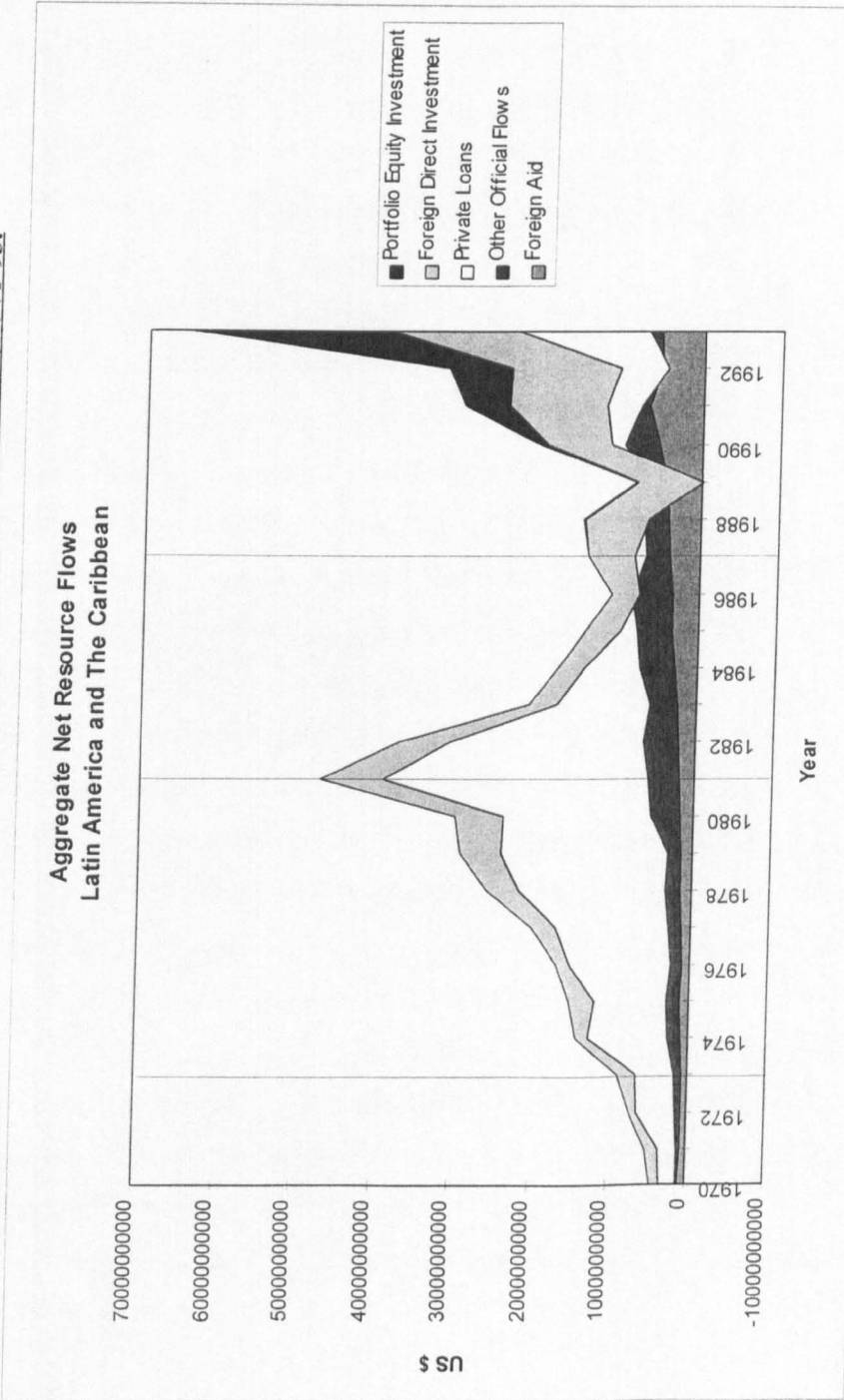


reducing the confidence of private investors and creditors, outflows of capital were observed. With the recovery from the international debt crisis, 4 countries out of 29 became the major recipients of net resource flows, they were Turkey, Portugal, the Russian Federation and Hungary. In 1993 they accounted for about 70% of total net resource flows distributed in that region. Portugal has recently been a new destination for private flows and official bilateral flows, the amount flowing in became important after 1989 and onwards. As figure 4.5 shows, there has been a big jump of net resource flows from 1988 to 1994. In fact some of the main recipients received substantial amounts, for instance in 1988 the Russian Federation received US \$ 3.17 billion of net resource flows, this amount tripled to US \$9.6 billion in 1990. These flows were mainly in the form of official loans and grants to restructure the economy. In the case of Hungary, with the fall of communism and the rise of a free market philosophy, significant resources have been flowing in, for instance in 1992 net resource flows were US \$1.4 billion while in 1993 they almost quadrupled to US \$5.4 billion. Of these foreign direct investment was more important than other flows. In fact, Hungary along with Poland and Portugal are the main recipients of FDI flows in that region.

#### **4.2.3 Latin America and the Caribbean**

The trend of net resource flows for the Latin American and the Caribbean countries (figure 4.6) resembles the trend described earlier for middle income countries (see figure 1.5). This is because 86% of the countries in this region have been classified under this category (25 out of 29 countries). The countries in this region have easy market access to private capital and have relied especially on loans from commercial banks. Official loans and grants accounted for less than 17% of the total in the 1970s and early 1980s but was around 74% in 1986 mainly because private loans dried up and there was even an outflow of private capital recorded in 1989.

Figure 4.6: Aggregate Net Resource Flows to Latin America and the Caribbean US \$ 1970-93.



During the oil crisis, this region received the highest amount of foreign capital. This peaked at US \$47 billion in 1981. The debt crisis (together with inflation problems) brought macroeconomic instability. Rising real interest rates increased the external debt service burden, so too did rising fiscal deficits. The capital flight which was observed in 1989 was because the returns from intrinsically profitable investment were likely to be taxed to service foreign debt, consequently a certain disincentive to undertake investment prevailed.

In the third phase, among the major Latin American debtor countries, a pattern of increasing differentiation in economic policies and performance emerged. One group of countries (Mexico, Chile, Columbia) has made considerable progress in establishing the conditions for basic macroeconomic stability and embarked on wide-ranging programmes of structural reforms. Another group of countries (Brazil, Argentina, Peru) is faced with a rapidly deteriorating macroeconomic situation, bordering on hyperinflation in some cases, and has made little progress in eliminating structural rigidities. These countries continue to experience debt service problems, whereas countries with strong macroeconomic control and structural reform programmes in place have been able to reduce their debt burden and have attracted higher foreign investment and, in the case of Mexico, a significant repatriation of flight capital. The recent fall in net resource flows has been attributed mainly to the Mexican pesos crisis in 1994. Argentina was mostly affected which was known as the “Tequila effect”, where the currency board system implied that the resulting drop in official reserves was automatically reflected in the monetary base, leading to a liquidity squeeze. Interest rates rose sharply, causing some firms to default and some banks to fail. This created a crisis of confidence in the banking sector. Other countries, for instance, in Brazil there were capital outflows recorded.

In this region, only a handful of countries have been receiving most of the net resource flows, they are Argentina, Brazil, Chile, Mexico and Peru. In the

1970s, Brazil and Mexico both accounted for around 65% of total net resource flows to the region of which for Brazil only it was 45% of total. In the 1980s, Argentina, Brazil, Columbia and Mexico were among the main recipients. Argentina became one of the major recipients in the 1980s as it suffered its longest period of stagnation this century. Savings and investment rates fell precipitously and there was an unstable macroeconomic environment prevailing. Resources were necessary to finance the public deficit which was 20% of GDP.

On the other hand Brazil's economic performance since 1981 has been poor in comparison to its potential. The inability of Brazil to cope with the oil price shocks, increases in real interest rates, the debt crisis and with poor management of public finances and heavy state intervention resulted in large fiscal deficits. Demand for external financing was on the rise. For Mexico, a structural reform programme was undertaken because of huge balance of payments and fiscal deficits. In the mid 1980s, Mexico adopted an outward-oriented and private-sector-led reform strategy which included public enterprise privatisation, public debt reduction and opening the economy to international competition. Private inflows were responding positively to the demand while official loans and grants were used to restructure the economy and partly as debt relief.

In the early 1990s, Argentina, Brazil and Mexico were still the major recipients of net resource flows but other countries also started to receive foreign assistance such as Chile and Peru. For this time period Mexico's net resource flows were the most significant, they increased from US \$ 9.4 billion in 1992 to US \$ 22.3 billion in 1993 (which was 35% of total net resource flows). This has been the outcome of the reform which re-established investor confidence in the Mexican economy: there were sizable private capital inflows and real domestic interest rates fell sharply. In 1993 portfolio equity investment was US \$ 14 billion in Mexico (56% of total) while it was US \$ 5.5 billion in Brazil

and US \$ 3.6 billion in Argentina. In terms of foreign direct investment, Argentina has been the most favoured country attracting 40% of the total FDI flows to the region followed by Mexico which accounted for 30%.

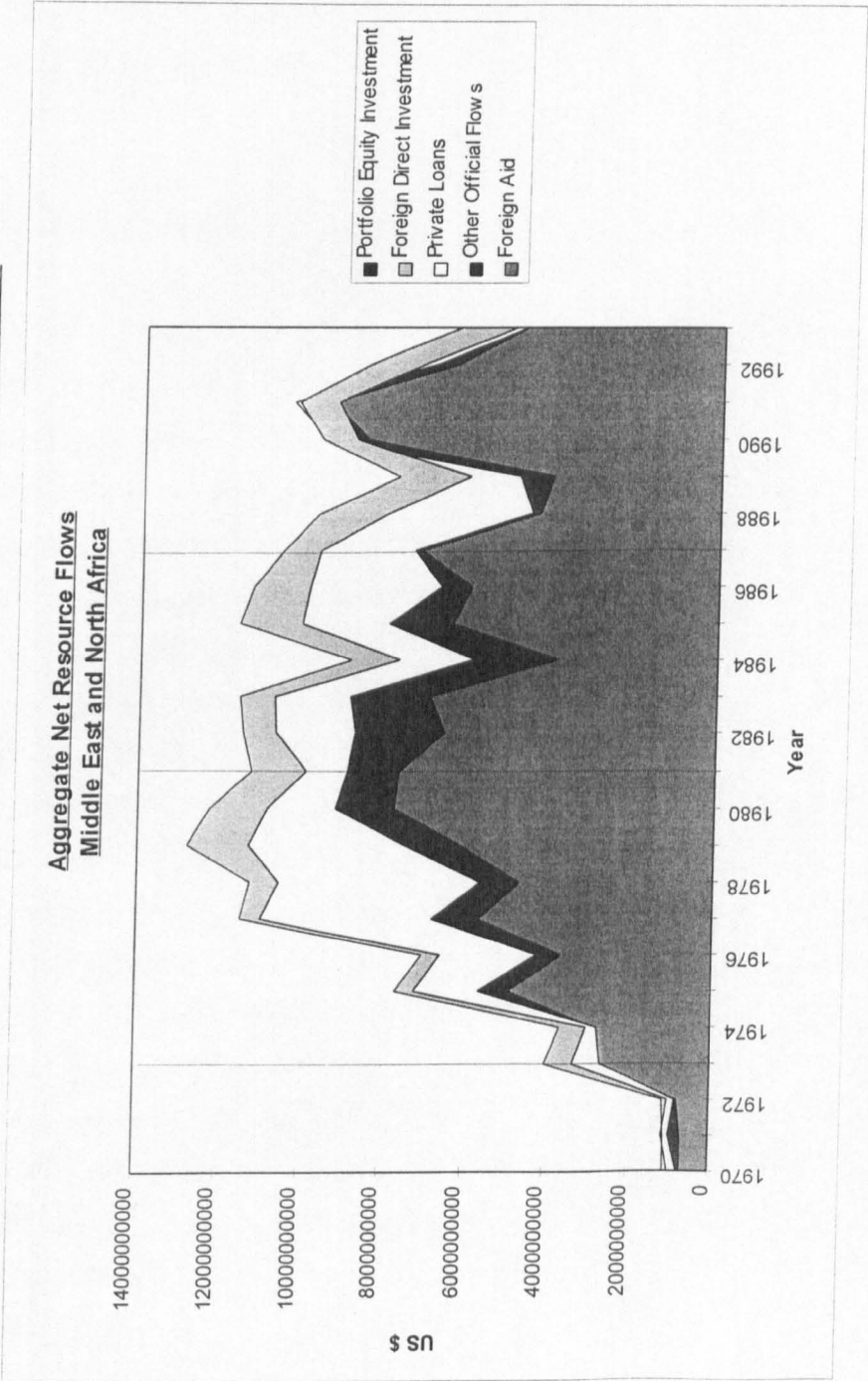
As mentioned above, official flows were mainly directed to Mexico to restructure its debt. In the early 1990s with the recovery of the international debt crisis there has been a preference towards private resource flows and less reliance on official flows. In fact official concessional loans and grants in the region accounted for only around 8% of total net resource flows after 1991 and most of which has been directed to Argentina. With recent macroeconomic stability in most of the countries in the region, the opening of trading opportunities and the level of income of most of the countries, it is expected that private flows will continue to be the major source of finance.

#### **4.2.4 Middle East and North Africa**

As with Middle East and North African countries, net resources have been flowing in a very erratic way over the time period 1970-1993 (see figure 4.7). Throughout the period foreign aid (mainly bilateral flows from the Arab countries) was more important than private flows except in 1988 when foreign aid and other official flows together fell by 46%. In the early 1970s, Egypt and Algeria were the main recipients of net resource flows. Algeria was receiving these mainly from France. With the oil price shocks many countries in that region relied on foreign aid—among these were Egypt, Morocco and Syria while Jordan and Syria received substantial grants. Most of the resources flowing in were from the Arab countries recycling their oil surplus revenues to the region. When oil prices increased by 130% between 1988 and 1979, net resources to these countries peaked to US \$ 12 billion. Thereafter with new oil supplies coming on-stream in Alaska, the North Sea and Mexico, oil prices started to fall and together with the beginning of the recession in the OECD countries, led to a fall of resources to these countries in phase II. Most of these



Figure 4.7: Aggregate Net Resource Flows to Middle East and North Africa US \$ 1970-93.

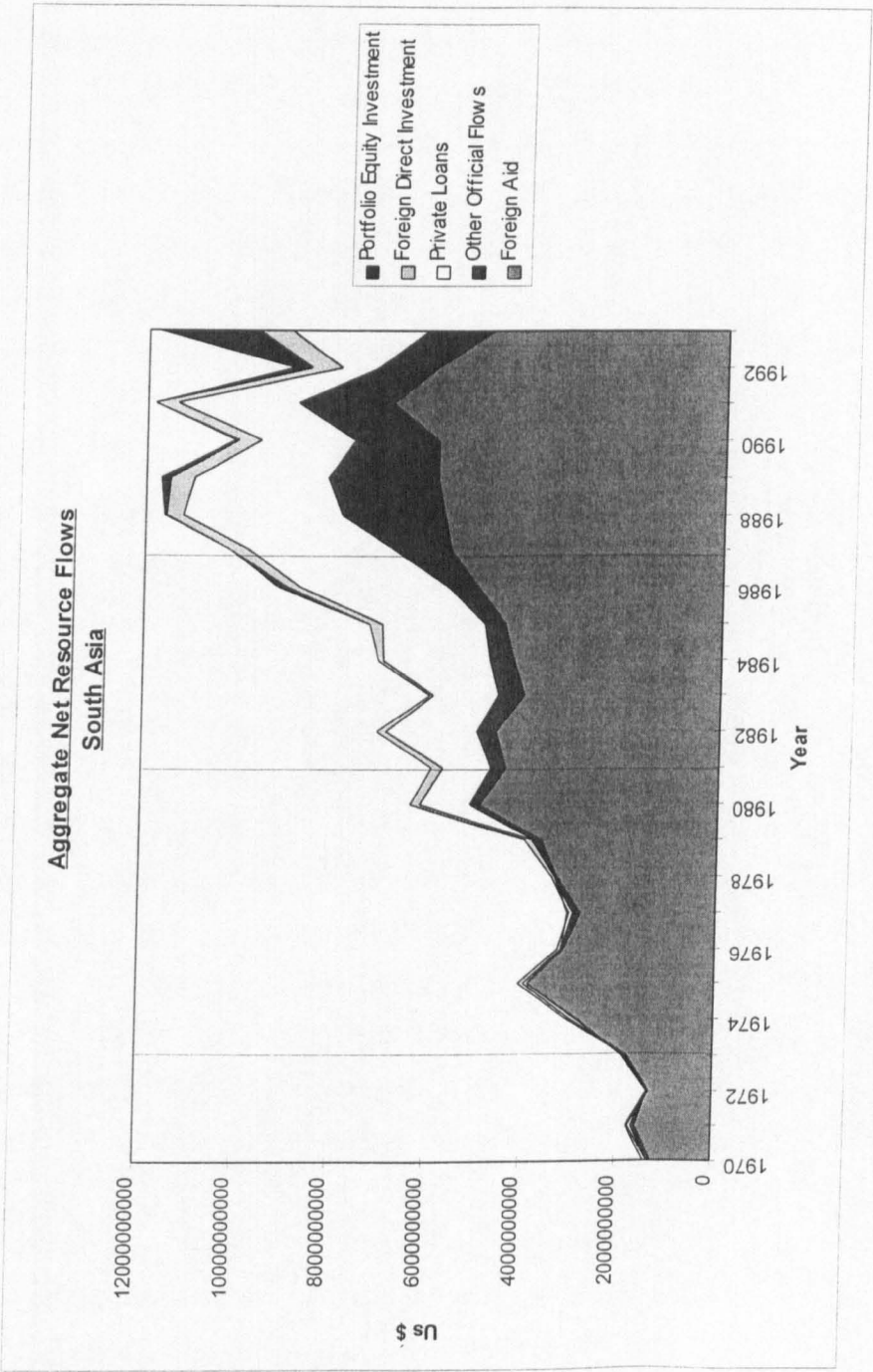


countries received substantial amounts of net resource flows for political reasons (Cassen *et al.*, 1994). During the Gulf War, Egypt has received important sum in terms of official grants mainly from the USA. After the Gulf War, net resource flows to that region have been on the decline but have been expected to increase in 1994.

#### **4.2.5 South Asia**

The other regions where most of the low income countries are located, South Asia and Sub-Saharan African, have trends similar to that depicted in figure 1.4 (see figures 4.8 and 4.9). The countries in both regions have relied heavily on foreign aid flows. In the case of South Asia, where all of the countries are in the low income category-except Maldives, the main recipients in the 1970s have been India, which accounted for 45% of total net resource flows, Pakistan and Bangladesh each receiving 25% of total net flows. The South Asian countries have on average received US \$2 per capita of net resource flows during the period 1970-1973, the lowest among all the regions (see table 4.1). This region still receives the lowest per capita net flows, for instance for the period 1990-1993 it received US \$9 while for Latin American and Caribbean countries it was US \$60. The three above mentioned countries are still the major recipients of net resource flows, in 1993 India received 60%, Pakistan 20% and Bangladesh 10% of total net flows. Foreign aid flows have mostly been directed to India and Bangladesh towards poverty relief and emergency funding for natural disasters. Of the foreign aid flows, multilateral loans were more important than bilateral ones. It is just recently that portfolio equity investment has started to flow in while official flows remain vital for this part of the world.

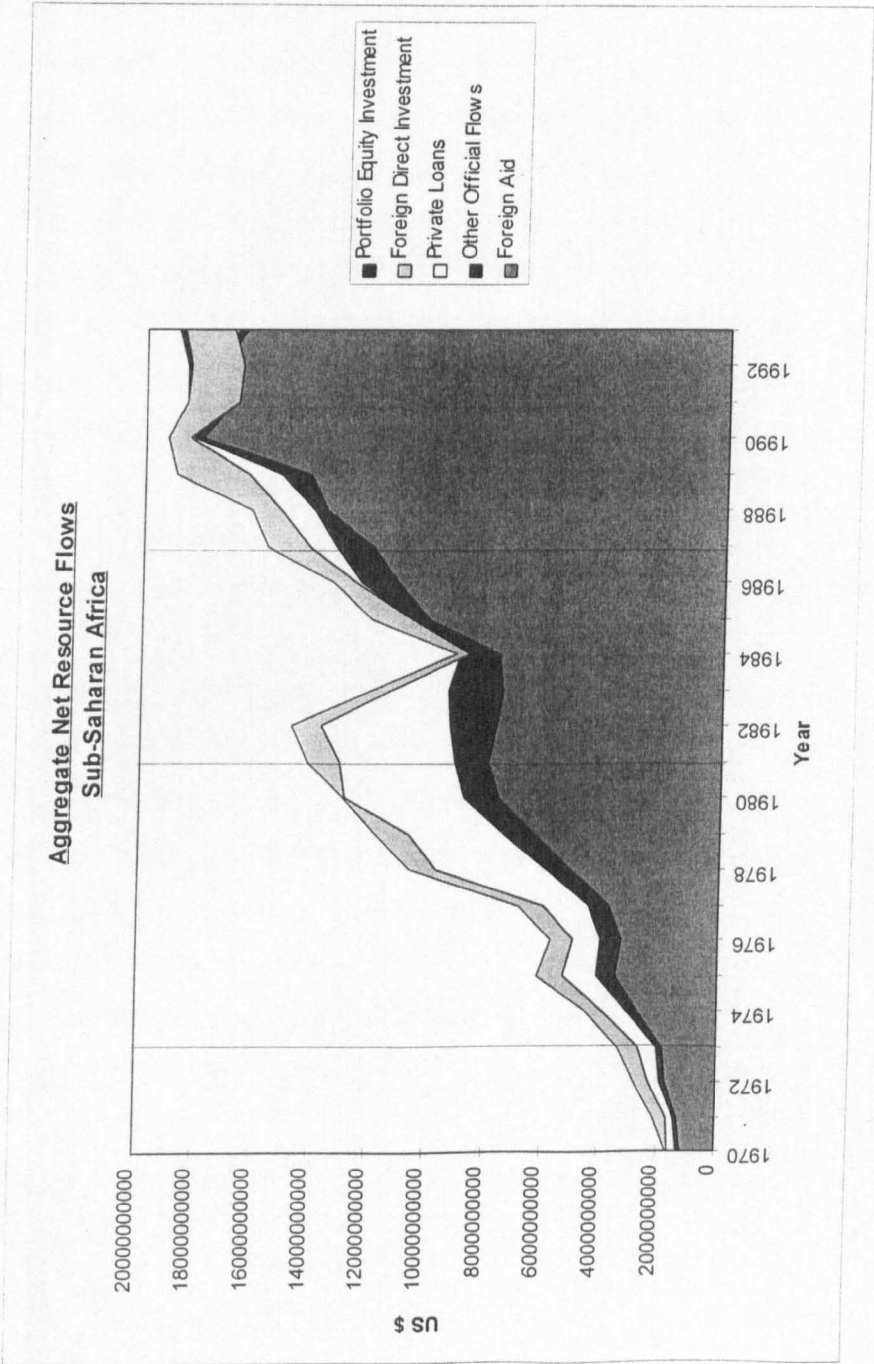
Figure 4.8: Aggregate Net Resource Flows to South Asia US \$ 1970-93.



### **4.2.6 Sub-Saharan Africa**

In Sub-Saharan Africa, 34 out of 45 countries are in the low income group. During 1970-1973, the countries received on average US \$7 per capita of net resource flows and foreign aid flows accounted for around 60% of total net flows (see figure 4.9). In the 1980s, Cote d'Ivoire, Nigeria, Sudan, Tanzania and Zaire were among the main recipients of in this region. Average per capita net resource flows have increased to US \$27 and net flows to other countries have increased, for instance to Angola, Cameroon, Ethiopia, Kenya, Nigeria, Somalia, Zambia and Zimbabwe. In 1993, Nigeria and Ethiopia each received 7% of total net flows, Mozambique and Tanzania 6% each, and Angola and Zambia 5% each. The rest of the countries received less than 4%, mostly around 2% of the total. Private flows have been very limited to the region, of which Nigeria was the main recipient of FDI flows. Only in Liberia and Mauritius has portfolio equity investment been undertaken. Most of the countries in this part of the world continue to rely mainly on official flows especially in terms of grants. Many authors have stressed the amount of foreign aid flows which has been flowing to Sub-Saharan Africa and have expected that the countries in this region to perform well, for instance, Cassen *et al.* (1994), Mosley (1984, 1987) among others. The fact that this region receives around one third of foreign aid flows does not necessarily imply that all countries are getting huge amounts of these flows. This is because there are 45 countries in this region, the highest number out of any other regions. In terms of per capita allocations, as seen earlier, they receive no more than a third of what Latin American and Caribbean countries get. Another reason is the fact that the countries in this region are among the poorest in the world so that resources are often diverted towards survival needs. Other reasons include internal problems caused by civil war and natural calamities. On top of that these countries are very vulnerable to external factors due to heavy reliance on agricultural products which command low prices and are exposed to high fluctuations.

Figure 4.9: Aggregate Net Resource Flows to Sub-Saharan Africa US \$ 1970-93.



**4.3 Statistics on Growth, Investment and Savings.**

The net resource flows to the developing countries are expected to have certain macroeconomic effects such as on growth of income, domestic investment and domestic savings. In earlier chapters, we described how foreign aid (and other capital imports), can increase income through different channels (for instance, increasing productivity, improving human capital, spillover effects and so on). All the theoretical models discussed earlier, the orthodox dual gap model, the Harrod-Domar growth model, the Neo-classical growth model along with some extensions and the endogenous growth model, have capital stock (or investment) or savings as one of the variables influencing growth of output. Foreign assistance is supposed to supplement domestic investment and savings so as to increase growth. In this respect, we first use some descriptive statistics to analyse the growth performance (trend), investment and savings and then we try to deduce statistically any relationship between foreign aid and growth.

The following is an account of the growth performance, investment ratio and the savings rate for the six regions. Table 4.2 provides a summary of the average growth rates of the six regions for the period 1970-1993 along with some statistics such as the standard deviation and the coefficient of variation which enable us to assess the relative dispersion of average growth rates of the countries in a particular region.

**Table 4.2: Average Real GDP Growth Rates (%) 1970-1993**

<b>Region</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Coefficient of Variation (%)</b>
East Asia and the Pacific	7.6	2.3	30.1
Europe and Central Asia	2.9	6.1	208.3
Latin America and the Caribbean	3.6	2.8	77.5
Middle East and North Africa	1.9	5.7	295.6
South Asia	4.3	2.9	66.9
Sub-Saharan Africa	2.7	2.2	82.2

Source: computed from World Bank Table, 1995.

It can be seen that, on average, the growth performance has been positive for all the countries between 1970-1993. The ultimate question to ask is whether the same average growth has been achieved throughout the period. Certainly not. The problem associated with this statistic (though useful) is that it hides many essential characteristics, for instance, when looking at the coefficient of variation a high degree of volatility (the relative dispersion) of the growth rates is evident for countries in regions achieving less than 3%. This would imply that there has been some significant fluctuations during the period.

The obvious solution then is to break down the period as was done when analysing the aggregate net resource flows. The three major international episodes which have influenced the world economic environment as described in figure 1.3 as the two oil price shocks, the international debt crisis, and trade liberalisation. They are labelled as Phase I, II and III respectively. From the literature review on foreign aid, this is the very time that such decomposition and analysis are being carried out. Previous authors had explicitly isolated the developing countries by not taking into account the international episodes so far described. In the next sections we explain why this is important. Only a few have implicitly incorporated some variables which are affected by these events, for instance, exports or the degree of openness, but not specifically explaining how these events affected growth in the presence of foreign capital flows. They have been preoccupied more by concentrating on deriving a snapshot relationship between aid and growth only.

Table 4.3 presents the break down of the average growth rates of the regions according to the main international events. In the 'pre-shocks' phase, 1970-1973, the average growth rates of each region are higher than the 'shocks' phases-except for South Asia which had lower growth in the beginning. Some plausible reasons could be due to the fact that many countries had adopted inward-oriented trade strategies which were not a success and also due to the

low level of savings which was not supplemented by external assistance. The high value of the coefficient of variation of 111% (see table 4.4) also suggests that during this period growth rates of the countries have been volatile to a large extent. Over the whole period, it can be seen from tables 4.3 and 4.4 that in most cases when the coefficient of variation is falling, the mean value of the growth rate increases. This implies, first, that the average growth rates for all the countries in the region are rising, and second that most of the countries are having growth rates closer to the mean value, that is, the volatility has been reduced. We now examine the macroeconomic performance in each region.

**Table 4.3: Average Real GDP Growth Rates (%) in different phases.**

Region	1970-1973	Phase I	Phase II	Phase III
East Asia and The Pacific	9	6.5	7.6	8.2
Europe and Central Asia	9.9	4.5	3.1	-4
Latin America and The Caribbean	7	4.4	1.9	2
Middle East and North Africa	N/A	2.6	0.9	2.3
South Asia	2.3	4.3	5.1	5
Sub-Saharan Africa	4.9	3.6	1.1	1.7

Source: same as Table 4.2.

**Table 4.4: Coefficient of variation in real GDP Growth Rates in different phases.**

Region	1970-1973	Phase I	Phase II	Phase III
East Asia and The Pacific	38.1	31.7	16.6	16.4
Europe and Central Asia	60.0	24.9	28.3	141.7
Latin America and The Caribbean	9.8	47.9	142.6	74.5
Middle East and North Africa	N/A	298.4	515.8	60.3
South Asia	111.3	83.2	19.9	49.0
Sub-Saharan Africa	42.9	51.6	108.2	85.5

Source: Computed.

The East Asian and Pacific region, on average between 1970-1993, has experienced the highest average rate of real GDP growth, 7.6 %. This is not surprising due to the presence of some Dynamic Asian Economies (DAEs)—China, Korea, Malaysia, and Thailand. The remarkable performance could



possibly be accounted by the high rates of investment and savings (the highest in all the regions, see Tables 4.5 and 4.6), flexible and efficient production structures and a strong outward orientation reflected in very rapid growth of both exports and imports. Throughout the period, investment and savings rates were both increasing, they averaged around 34% in 1990-1993. Although in the beginning, an increase in these rates was observed in phase I, the average GDP growth rate fell due to the oil shock which affected demand for their exports in the OECD countries (their main importers), figure 4.10 in Appendix 4.1<sup>1</sup> depicts this clearly. The OECD countries had experienced the sharpest decline in output and the highest unemployment since World War II. In the early 1980s, when recession hit most industrialised countries, the investment and savings rates of the East Asian and Pacific countries stabilised at around 25% and with some increases in private net flows (see figure 4.4), GDP growth was around 5%. In phase II, the average growth improved further due to continuously increasing domestic investment and savings rates. The coefficient of variation in this phase was half that of the previous phase, indicating that growth of the countries in this region became less volatile than before. This suggested that the debt crisis had not exacerbated growth of these countries—most of the investment resources came from domestic savings which rose sharply in this phase (see figures 4.11 and 4.12).

With trade liberalisation and the ending of the debt crisis (phase III), real exports revenues increased sharply in 1988 as a result of strong demand in OECD countries and rising relative prices of commodities. The growth rate was around 10% in that year. Thereafter the growth rate was around 7% in 1989 and has since been rising at an increasing rate taking advantage of liberalisation in the world economy. This reflects the openness and competitiveness of the countries in this region. Despite high rates of domestic investment and savings, the growth impetus seems to come from increasing foreign direct investment which remains important in this part of the world (OECD Economic Outlook).

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<sup>1</sup> In Appendix 4.1 figures 4.10 to 4.27 are depicted.

In Europe and Central Asia, the region was experiencing the highest growth rate in the period 1970-1973, around 10%, but excluding 1970 which was an exceptional year, it averaged around 6%. Since then it has followed a smooth downward trend (as confirmed by the coefficient of variation) during phase I and II, see figure 4.13. Domestic investment and savings rates were around 30% in phase II (see tables 4.5 and 4.6). Foreign direct investment in this area has been very disappointing, but with fall of communism and opening of markets in the EEC, this form of investment has started to rise since 1992.

**Table 4.5: Average Domestic Investment Rates (%) in different phases**

Region	1970-973	Phase I	Phase II	Phase III
East Asia and the Pacific	23.9	26.2	29.1	33.5
Europe and Central Asia	N/A	N/A	29.9	28.4
Latin America and the Caribbean	22	24.6	19.3	20.3
Middle East and North Africa	N/A	26.6	25.2	23.9
South Asia	16.5	20.2	21.8	23.5
Sub-Saharan Africa	21.8	24.6	18.1	17.2

Source: same as Table 4.2.

**Table 4.6: Average Domestic Savings Rates (%) in different phases**

Region	1970-973	Phase I	Phase II	Phase III
East Asia and the Pacific	23.5	25.5	28.8	34.1
Europe and Central Asia	N/A	N/A	30.2	26.8
Latin America and the Caribbean	20.6	22.9	22.3	21.3
Middle East and North Africa	N/A	37.8	22.3	21.8
South Asia	14.8	17.2	17.6	20.3
Sub-Saharan Africa	20.1	23.3	17.6	17.3

Source: same as Table 4.2.

With the emergence of the New Independent States, the average growth rates in the region deteriorated further during phase III, as output in these countries were falling due to civil war disturbances. Both domestic savings and investment rates fell, the domestic savings rate fell drastically to about 20% of GDP while the investment rate was around 27% in 1992. During this phase growth rates have been much more volatile than before. Low productivity and

poor allocation of investment from 1989 have resulted in adequate and badly adapted supply, contributing to mismatches between supply and demand at the microeconomic level, and to persistent excess demand overall. Excess demand, in turn, has led to sometimes sharp increases in both open and repressed inflation. Macroeconomic imbalances have in some cases, notably Poland, been compounded by loss of confidence in dramatic currency, giving rise to severe stabilisation problems and hyperinflation. With stabilisation and structural adjustment in place in these NIS countries, some recovery in activities are expected in the mid-1990s (OECD Economic Outlook).

In Latin America and the Caribbean, after a period of high growth rates in 1970-1973, the countries in this region suffered the adverse impact of the oil price shock as most other developing countries. Growth rates fell from 7% in 1970-1973 to 4.4% on average during the period 1974-1981 (see table 4.3). Resource transfers to this region are seen to have supplemented domestic investment especially during phase I. In fact, investment rates were around 25% while domestic savings averaged 23%. The gap between investment and savings being closed especially by private flows. Private loans, which were cheap and which could be accessed easily, were being used to finance oil imports. The adverse effect of the oil price hike might have been responsible for the fall in GDP growth which fell from a peak of 8% in 1973 (see Figure 4.16). In 1979-80, an improvement was observed, possibly due to the second oil price shock which generated some windfall gains to Mexico's oil export.

The debt crisis had a significant impact on this part of the world. In the early 1980s, the growth rates of many countries in this region were deteriorating due to rising inflation rates, the incipient debt crisis, recession in the OECD countries, huge fiscal deficits and fall in the investment rates (from 25% in 1980 to around 17% in 1983, see figure 4.17) although sufficient domestic savings were available (figure 4.18). This is partly due to poor real rates of return obtainable in that period. Many countries contracted the IMF

Stabilisation and World Bank Structural Adjustment Programmes through which recovery was observed in many cases in the mid-1980s. In the late 1980s, although domestic investment rates were rising, they were still less than the savings capacity and together with capital flight, as explained earlier, growth performances were rather poor, less than 1%. A foreign exchange or fiscal gap could possibly best characterise this situation. There were also some disruptions in Brazil's export supply. Countries which were heavily-indebted in this region had their growth retarded by the possible role of "debt overhang".

During the early 1990s many countries embarked on economic reform programmes and the third phase shows the payoffs of countries which made considerable progress in establishing the conditions for basic macroeconomic stability. Despite some falls in the domestic investment and savings rates, GDP growth was rising due to heavy investment by private investors. The amount of foreign direct investment, portfolio equity investment and significant repatriation of flight capital might have been responsible for growth to resume in phase III. With the beginning of the trade liberalisation episode, many countries adopted a more open trade regime, for instance, Argentina, Chile, Mexico, as well as the Andean Pact member countries-Bolivia, Columbia, Ecuador, Peru, and Venezuela-have enacted new, more liberal and transparent foreign direct investment codes. Mexico has also pursued a policy of opening the domestic market to foreign competition, with a reduction of import tariffs and elimination of most import licences.

The resurgence of free trade areas in Latin America is also providing a stimulus. In addition to the North American Free Trade Agreement (NAFTA), Mexico has agreed to establish a free trade agreement with Columbia and Argentina over a 10-year period. Other integration agreements include the Southern Cone Common Market (MERCOSUR), consisting of Argentina, Brazil, Paraguay, and Uruguay; the Andean Group; the Central American

Common Market and CARICOM, which have been implemented by the larger Caribbean countries. These are all helping to promote growth in the region.

Despite observing some fall in the savings rates in the 1990s, GDP growth has been increasing. This characterises the role of foreign assistance, especially private net flows, supplementing domestic savings. Private capital flows have been attracted by high real rates of return compared to those obtainable in the U.S. in particular, and by renewed investor confidence in the medium-term growth outlook. This confirmed the trend which began in the early 1990s, and caused most currencies to appreciate in real terms. With these conditions further growth achievements are expected to continue in the future.

Among all the regions, Middle East and North Africa have experienced the lowest average rate of GDP growth during the period 1970-1993, 1.9%. Figure 4.19 illustrates the average growth rates of the countries in the region. As can be seen, just like the net resource flows, the growth rates over the period show considerable volatility. In fact the coefficient of variation is as high as 296%, the highest among the regions in the period 1970-1993. During the oil shock, the countries in this region were badly hit, growth rates fell from 15% in 1976 to around -10% in 1981. It is worth noting that during the oil crisis, despite having high domestic savings rates and high inflows of net resources (of which foreign aid was significant), investment rates were well below the savings capacity. This is a case where resources were mostly diverted towards consumption and non-productive investment. Growth followed a downward trend. During phase II the same scenario was observed and it was only after 1988 when both investment and savings rates started to rise that the growth rates of the countries in the region began to increase, see figures 4.20 and 4.21. In the early 1990s, phase III, with economic reforms in some countries, growth performance was better than previous phases. It was only in this phase that the average savings rate was lower than the average investment rate, see tables 4.5 and 4.6. Despite this net resource flows were less than those recorded in the

late 1970s and early 1980s, it implies that these resources were mainly supplementing domestic savings and investment. Growth rates averaged 3% in this period.

South Asia, where the world's poorest countries are located, has on overall achieved on average a good growth performance during the period 1970-1993. It averaged around 4.3% (see table 4.2 and figure 4.22). Full credit should be given to these poor countries because during the oil crisis while other regions were facing continuous decline in their real GDP growth rates, most of the South Asian countries managed to achieve an average growth rate of 4%. This would imply that most countries pursued a sound macroeconomic management and were using the proceeds from agricultural booming prices in 1973 towards productive investment. Also during this phase despite having, on average, a savings rate of 17%, domestic investment as a percentage of GDP was around 20% (see figures 4.23 and 4.24 and Tables 4.5 and 4.6). We find here also a case where foreign assistance has helped in closing the investment-saving gap. In fact, not only in phase I, but throughout the period 1970-1993 was domestic investment greater than domestic savings.

As pointed out earlier, the three main recipients-India, Bangladesh and Pakistan-have relied mostly on foreign aid. Economic development in these countries has improved over the last two decades. India, for instance, pursued a planned approach that combined prudent macroeconomic management; an active state role in key sectors such as banking, basic industries, utilities, and infrastructure; and extensive regulation of the economy. However, although highly regulated, the private sector was important and was present in most sectors of the economy. Throughout the 1980s important policy changes liberalised trade, industry, and the financial sector, while subsidies, tax concessions, and the depreciation of the currency improved export incentives. These measures helped GDP growth to accelerate over 5% a year during the 1980s and reduced poverty more rapidly. But India's most fundamental

structural problems were addressed only partially. Tariffs continued to be extremely high and quantitative restrictions remained pervasive. In the late 1980s these problems were compounded by political uncertainty. There were two general elections and four changes of government between end-1988 and July 1991. Growth rates in between that time deteriorated. The August 1990 developments in the Persian Gulf put additional pressures on the balance of payments and eroded the confidence of foreign lenders. Capital outflows accelerated and commercial banks reduced their exposure in India. Multilateral and bilateral aid, particularly from Japan, provided significant assistance in the first half of 1991.

In June 1991 a new government launched a comprehensive economic stabilisation programme and a major transformation of India's development strategy. A new industrial policy announced in late July, together with the revised budget, liberalised one of the most controlled investment regimes in the world. The rupee was devalued by 22% in dollar terms. In April 1992, virtually all licensing restrictions on imports of capital goods and intermediates were eliminated. Growth prospects seem propitious in the 1990s following these measures.

Pakistan, on the other hand, although experienced some windfall gains in the 1970s from increases in cotton prices, has experienced considerable political turmoil for several years which had effects on its growth. The level of investment and savings in the economy remains too low to sustain growth. As a consequence, Pakistan compares unfavourably with fast-growing economies in Asia in terms of physical infrastructures-basis transport, power, and telecommunication-and even more so in human resources development. The country relies to a large extent on foreign aid. The country also continues to grapple with difficult political, social/cultural, and governance issues that affect the pace and effectiveness of its economic development effort. In the late 1980s, ethnic and tribal conflicts have also contributed to periodic law and

order problems, which have been exacerbated by drugs and corruption. These difficulties have slowed implementation of development projects and affected the location and size of new investments with the international community embarking on trade liberalisation scheme, Pakistan adopted trade policy reforms in two phases. Still though the country is exposed to substantial risks posed by vulnerability to external and internal shocks and policy slippage. On the external front, the main sources of risks are fluctuations in cotton and oil prices, slow growth in OECD countries, changes in interest rates (given the amount of external borrowing on variable terms), and sudden outflows of capital. On the internal side, the cotton virus is having a major impact on cotton production, which is likely to continue to be affected for several years. But it is expected that with trade liberalisation and investment opportunities, growth will prosper.

Bangladesh, has been vulnerable to devastating cyclones and floods. Structural adjustment programme were in place since the beginning of the 1990s and brought macroeconomic stability and improvements in public resources management. Bangladesh remains heavily dependent on foreign aid, with over 50% of its Annual Development Program financed by concessional project aid. Trade liberalisation has advanced significantly in an effort to remove anti-export and anti-private sector biases. To encourage the private sector, the government is reforming fiscal and financial incentives and the regulatory and legal environment. A phased programme of import liberalisation covering both quantitative restrictions and tariff rationalisation is in progress. Measures have been taken to improve export incentives and investors are particularly attracted by cheap labour. In the 1990s, the savings rates have been more than double those of the 1980s.

The efforts of the countries in this region can be characterised as being remarkable despite many factors inhibiting their growth. While many 'radical' authors have emphasised the negative aspect of foreign aid on growth, these



countries have shown that efficient use of foreign aid and other flows can be made. It can be found from figures 4.23 and 4.24 that investment and savings have increased over time despite low incomes per capita. These require in real terms a high opportunity cost. In fact the lower savings rates than investment implies that additional foreign resources have helped in supplementing domestic savings. Gang and Khan (1991) have also shown that official loans were used more productively than grants in the case of India. With trade liberalisation, these countries need to be vigilant and cautious, especially when they are exposed to fierce competition from the East Asian and Pacific countries.

Sub-Saharan Africa includes the poorest countries in the world. Growth performance has not been remarkable over the period 1970-1993, it has instead followed a downward trend (see figure 4.25). The level of poverty in this region hinders growth at large (or it could be the other way round!). In the beginning of phase I, despite the first oil price shock, many countries achieved some remarkable growth rates, due to booming agricultural prices in 1973. Boom conditions in industrial countries, which fuelled these prices, also contributed to strong volume demand for these exports; but in the following year this was more than offset by the rising volume of these countries' imports. Over the whole period, just like South Asian countries, foreign aid has been more important than private flows. But contrary to South Asia, the growth performance has been disappointing. This is not surprising given the investment and savings rates, the lowest since the 1980s. They have been falling on average over the period 1970-1993 as figure 4.26 and 4.27 depict. The continued increase in foreign assistance, mainly in terms of foreign aid, seems to be directed mostly to consumption rather than productive investment, given that many countries have their population below the poverty line.

This region faces an enormous problem if efforts are not made to invest foreign capital productively, especially when both the investment and savings rates are

falling (see tables 4.5 and 4.6). Phase III characterises clearly this outcome. Without an increase in these rates, it would be difficult to sustain growth of income. There have been some signs that structural reform policies, when strongly supported by external finance and not undermined by weather and political problems have shown results. But in the late 1980s and early 1990s, the terms of trade outlook has been less favourable, prices of a number of commodities crucial to individual countries have fallen, and the collapse of the coffee pact is symptomatic of the difficulties commodity exporters face in seeking to hold up their terms of trade through commodity cartels. Sub-Saharan Africa's share of world markets has almost halved since 1970 and this loss is expected to continue. With trade liberalisation, the type of commodities (mostly primary agricultural goods) which are mainly produced by the countries in this region put them at a disadvantage as they command low prices and are affected by climatic conditions. Diversification, with the help of foreign assistance, has proved to be beneficial in some countries (for instance, Botswana, Ghana, Mauritius) and this can be taken as an example for other countries.

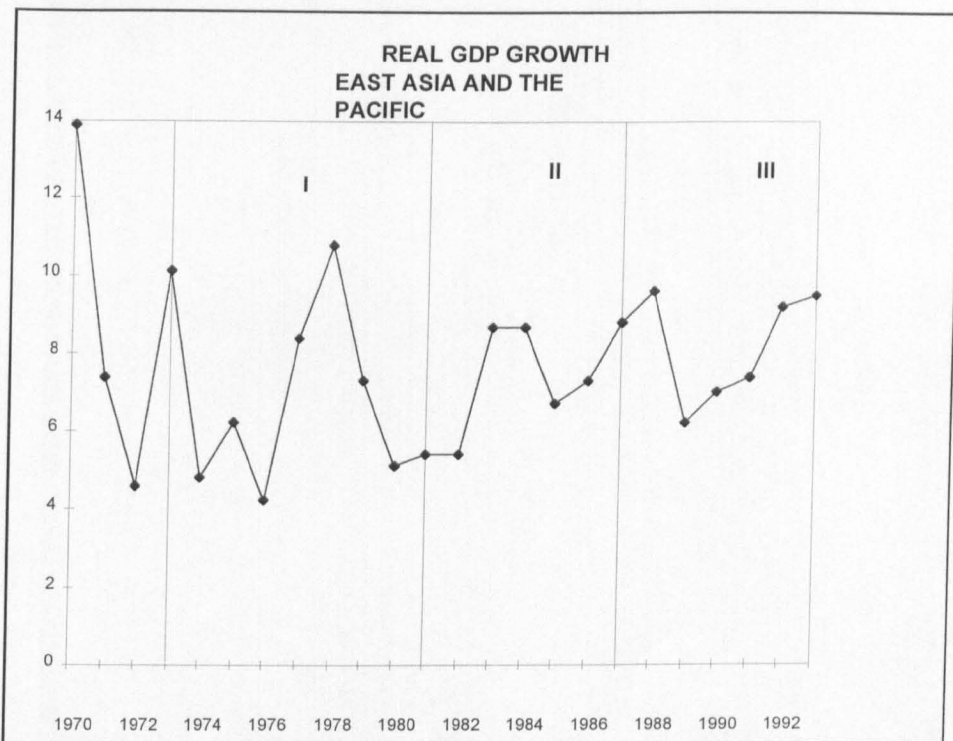
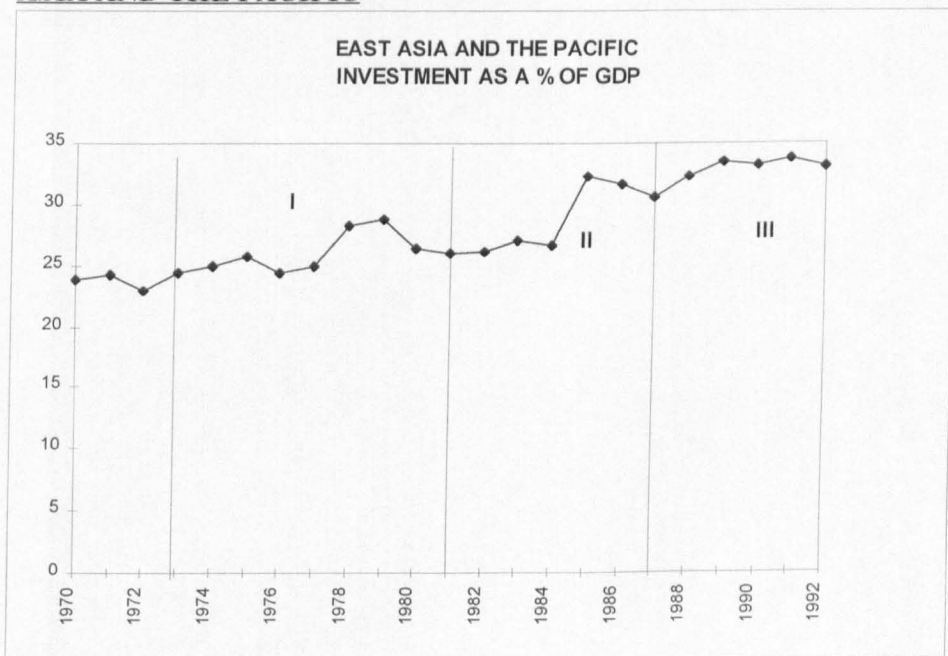
#### **4.4 Concluding Remarks.**

It was observed in Chapter 1 that the distribution of net resource flows between middle income countries and low income countries differs. While the former has more access and reliance on private capital flows, the latter continues to rely on official flows, mainly in the form of foreign aid. Breaking down the countries into the six regions gave an indication where most of the middle income and low income countries are clustered. Most of the middle income countries are located in Latin America and the Caribbean and Europe and Central Asia regions while South Asia and Sub-Saharan Africa account for most of the low income countries. Private net flows are seen to be more important to the Latin American and Caribbean countries while foreign aid flows are of utmost importance to the countries in South Asia and sub-Saharan

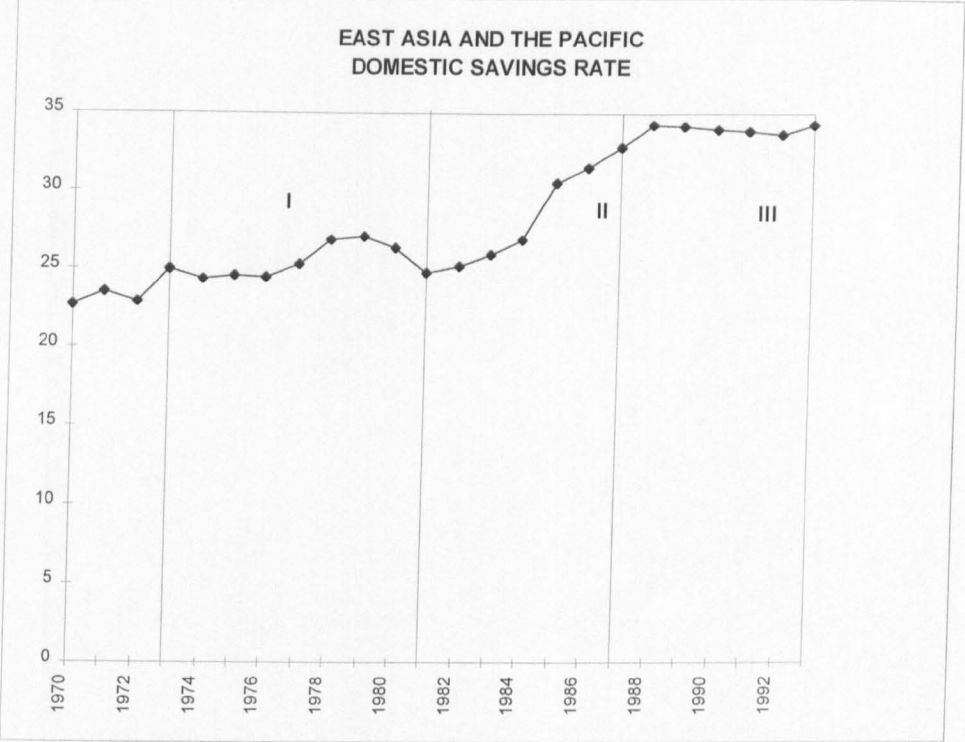
Africa (see figure 4.28 in Appendix 4.2). It is observed that since 1990 the New Independent States have been allocated some important amounts of foreign aid in helping them to build their economic base.

The growth rates of income of the developing countries have been affected mainly by the external economic developments, their domestic investment and savings rates, and foreign transfers. In most cases investment rates have been rising in the 1990s even though domestic savings were falling in some cases, for instance in Latin America and the Caribbean. Whether only foreign aid has affected growth or not, or has been used for consumption rather than for investment purposes needs to be found- the so-called fungibility. But it is without doubt that private investment in the Latin America and the Caribbean and in East Asia and the Pacific regions has improved the growth performance, especially in the third phase. Other region such as Sub-Saharan Africa, foreign aid was directed mainly to poverty alleviation, rebuilding certain basic infrastructure and towards 'unproductive' activities. For both Sub-Saharan Africa and South Asia, the 1990s remains a challenge for future growth as many other developing countries in other regions have already established a programme of trade liberalisation and reforms. There is a high need for them to catch up. This also implies that they need to be ready for greater competition.

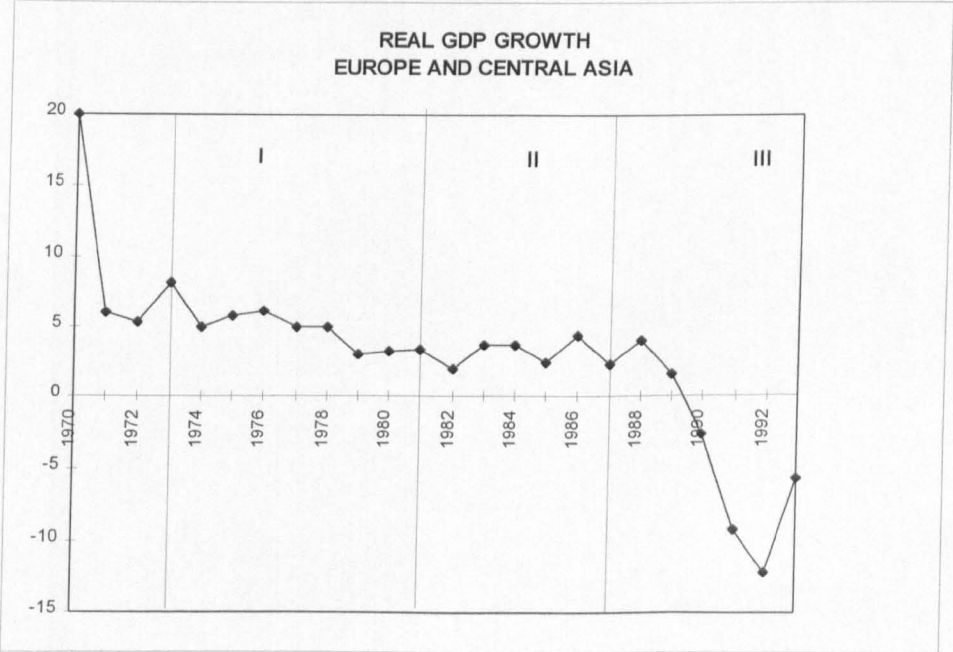
Overall the two unfavourable shocks, that is phase I and phase II, have caused many countries to experience high volatility in their growth rates (as indicated by the high coefficient of variation values, see Table 4.4). In the third phase, however, this volatility has been reduced. We have observed that instabilities in the external economic environment have considerable impact on growth in developing countries. These instabilities in turn can affect the effectiveness of foreign aid. So far in the aid literature these instabilities have been overlooked. In the next chapter we present a simple taxonomy to explain how aid's effectiveness can be affected.

**APPENDIX 4.1****Figure 4.10: REAL GDP GROWTH IN EAST ASIA AND THE PACIFIC****Figure 4.11: DOMESTIC INVESTMENT AS A % OF GDP IN EAST ASIA AND THE PACIFIC**

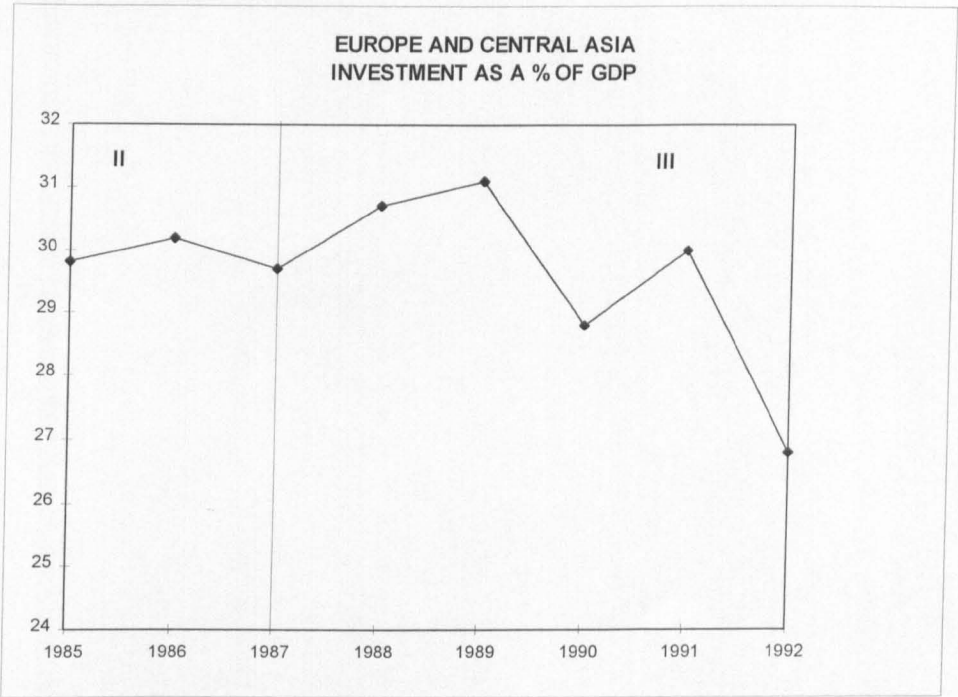
**Figure 4.12: DOMESTIC SAVINGS AS A % OF GDP IN EAST ASIA AND THE PACIFIC**



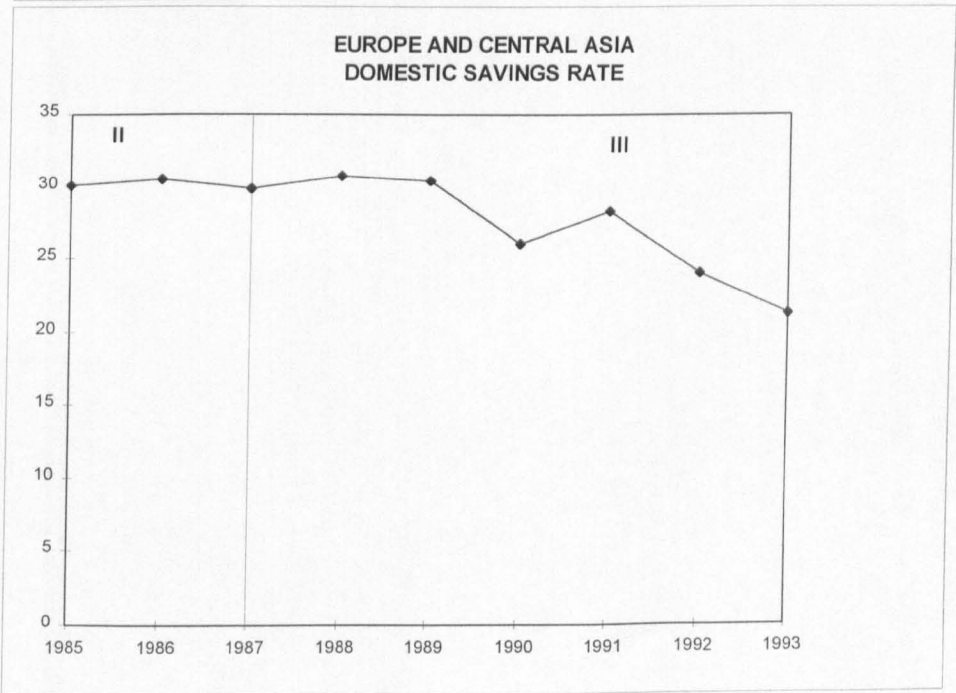
**Figure 4.13: REAL GDP GROWTH IN EUROPE AND CENTRAL ASIA**

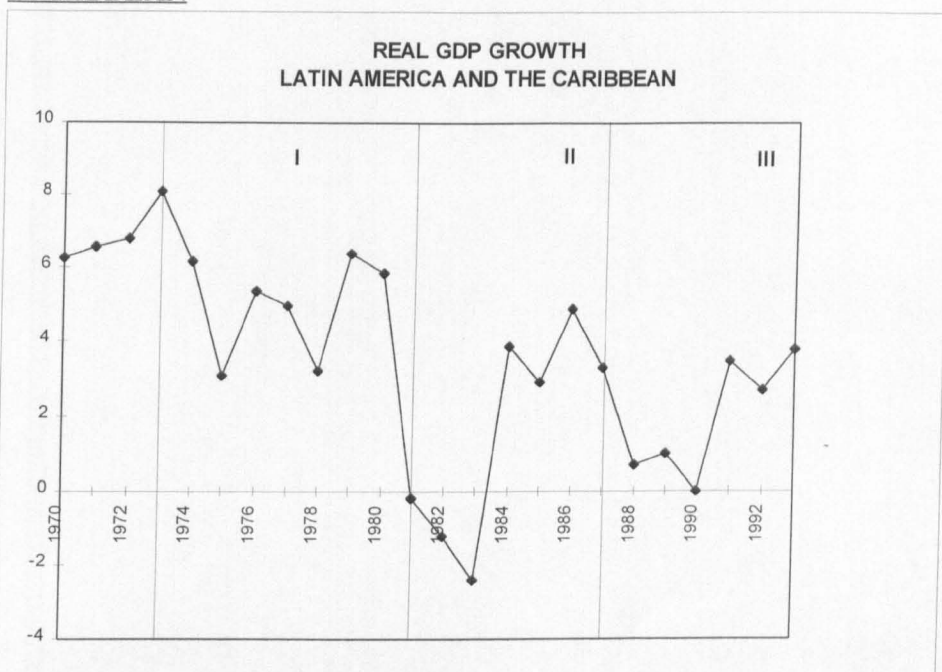
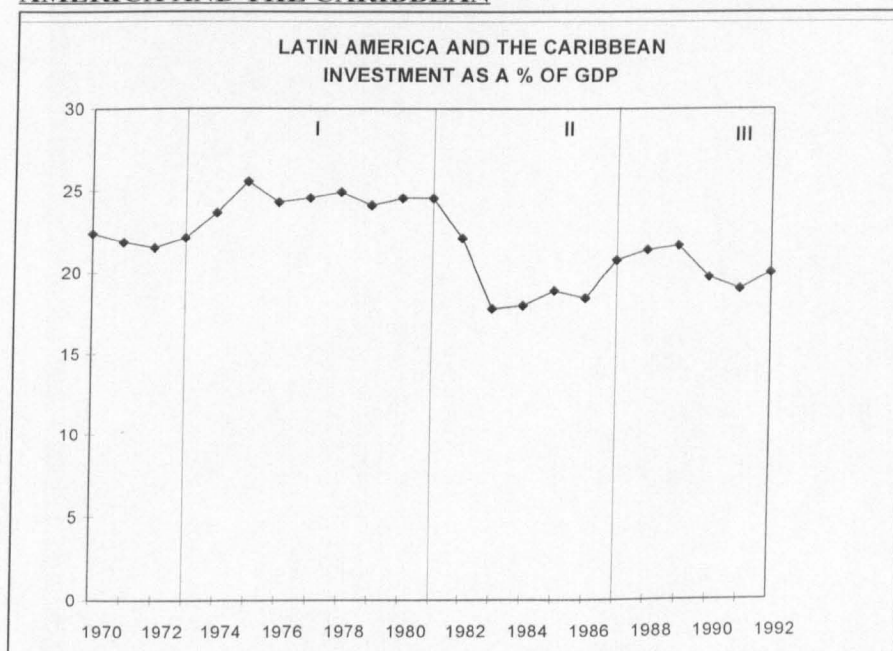


**Figure 4.14: DOMESTIC INVESTMENT AS A % OF GDP IN EUROPE AND CENTRAL ASIA**

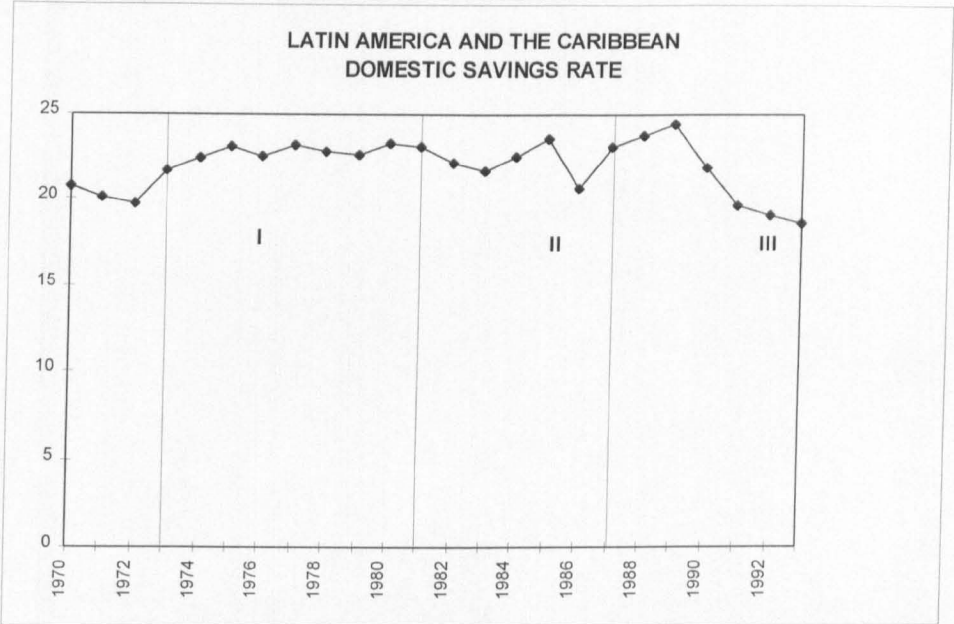


**Figure 4.15: DOMESTIC SAVINGS AS A % OF GDP IN EUROPE AND CENTRAL ASIA**

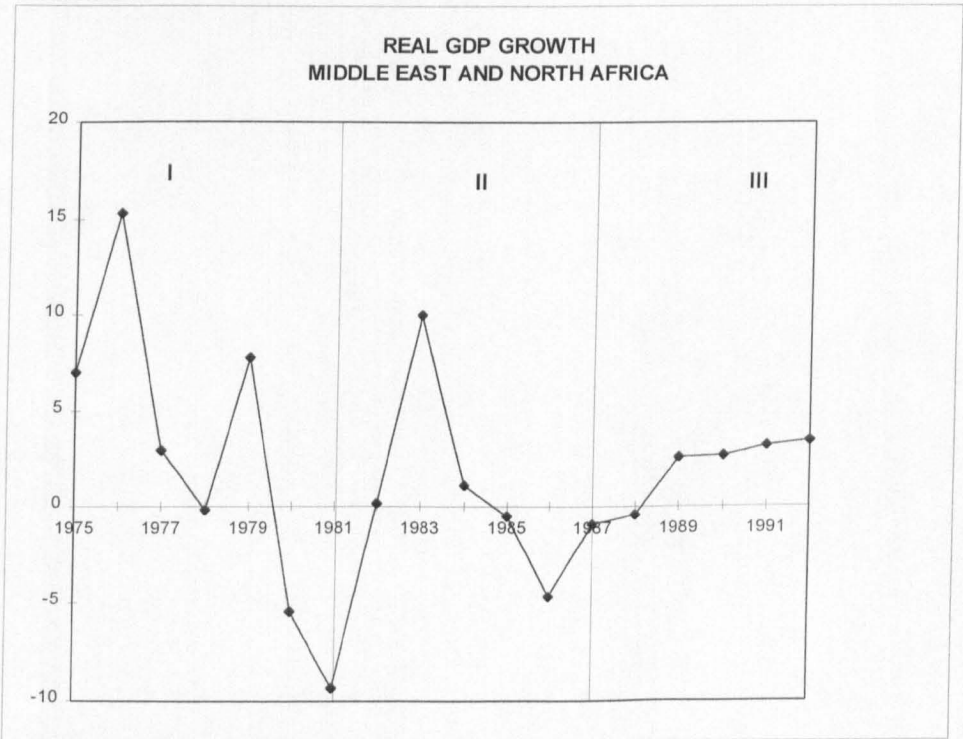


**Figure 4.16: REAL GDP GROWTH IN LATIN AMERICA AND THE CARIBBEAN****Figure 4.17: DOMESTIC INVESTMENT AS A % OF GDP IN LATIN AMERICA AND THE CARIBBEAN**

**Figure 4.18: DOMESTIC SAVINGS AS A % OF GDP IN LATIN AMERICA AND THE CARIBBEAN**

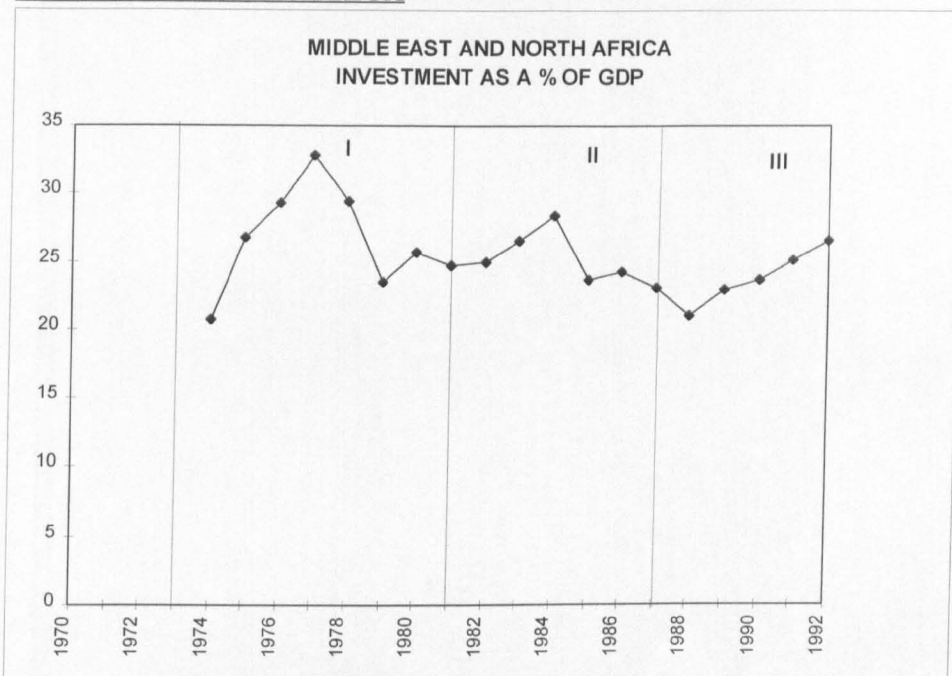


**Figure 4.19 :REAL GDP GROWTH IN MIDDLE EAST AND NORTH AFRICA**

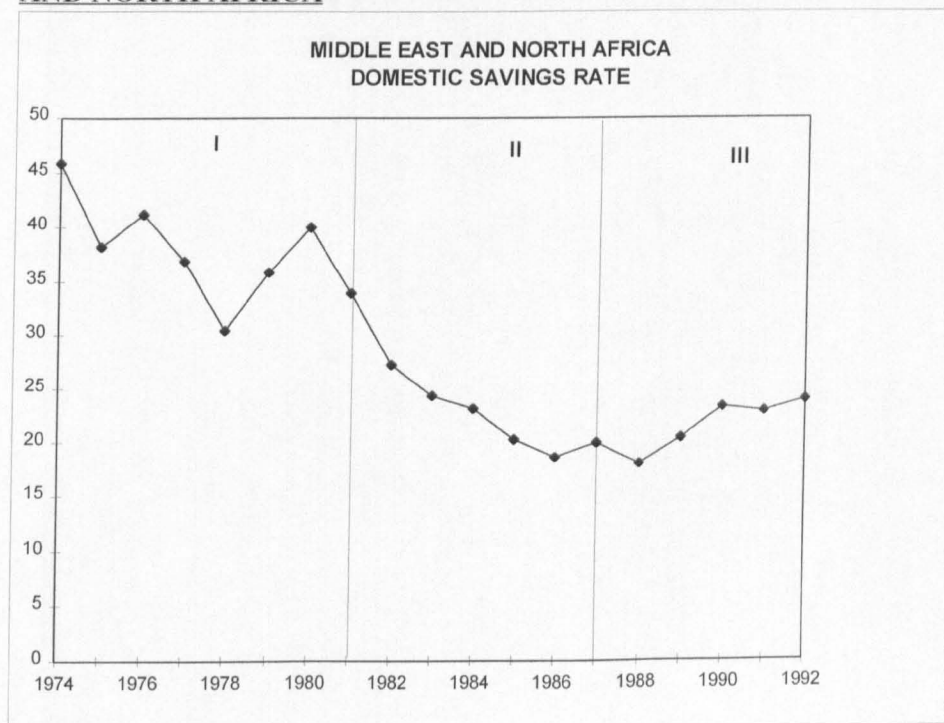




**Figure 4.20 :DOMESTIC INVESTMENT AS A% OF GDP IN MIDDLE EAST AND NORTH AFRICA**



**Figure 4.21: DOMESTIC SAVINGS AS A% OF GDP IN MIDDLE EAST AND NORTH AFRICA**



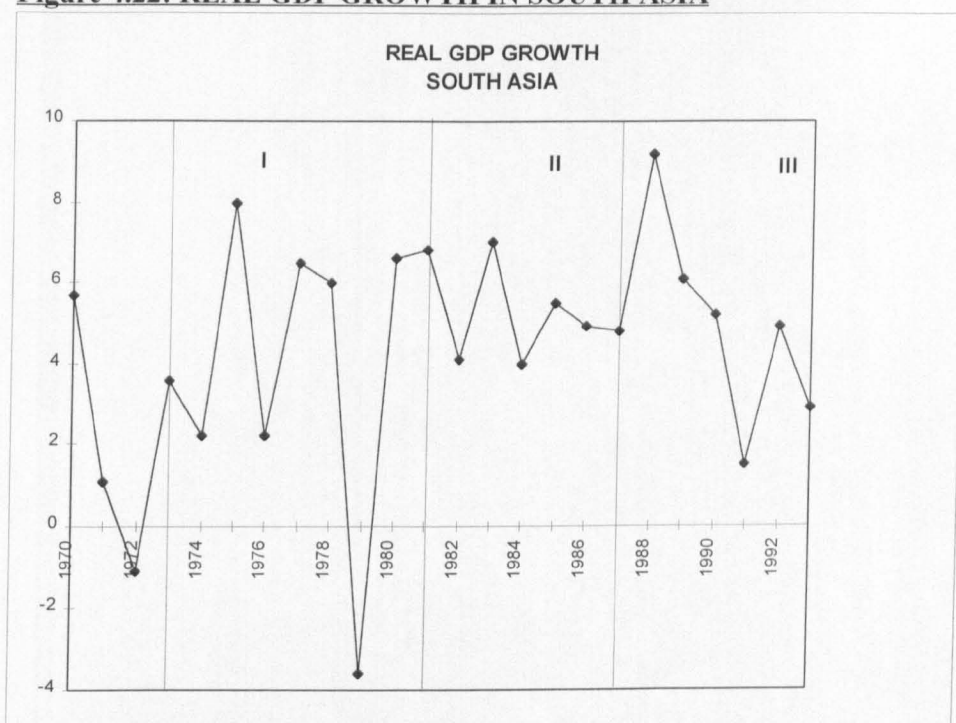
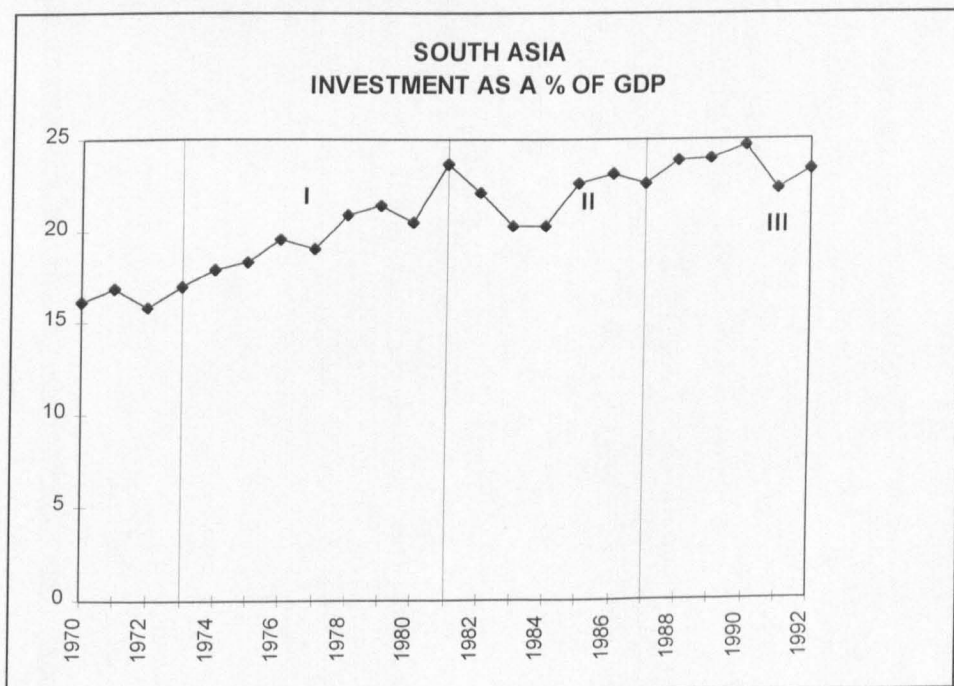
**Figure 4.22: REAL GDP GROWTH IN SOUTH ASIA****Figure 4.23: DOMESTIC INVESTMENT AS A % OF GDP IN SOUTH ASIA**

Figure 4.24: DOMESTIC SAVINGS AS A % OF GDP IN SOUTH ASIA

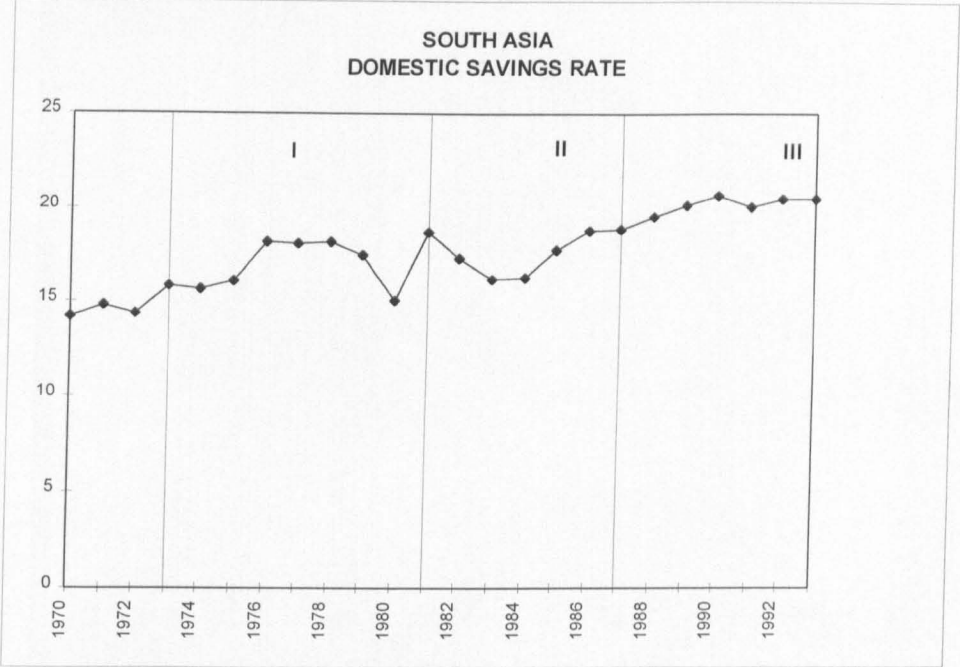
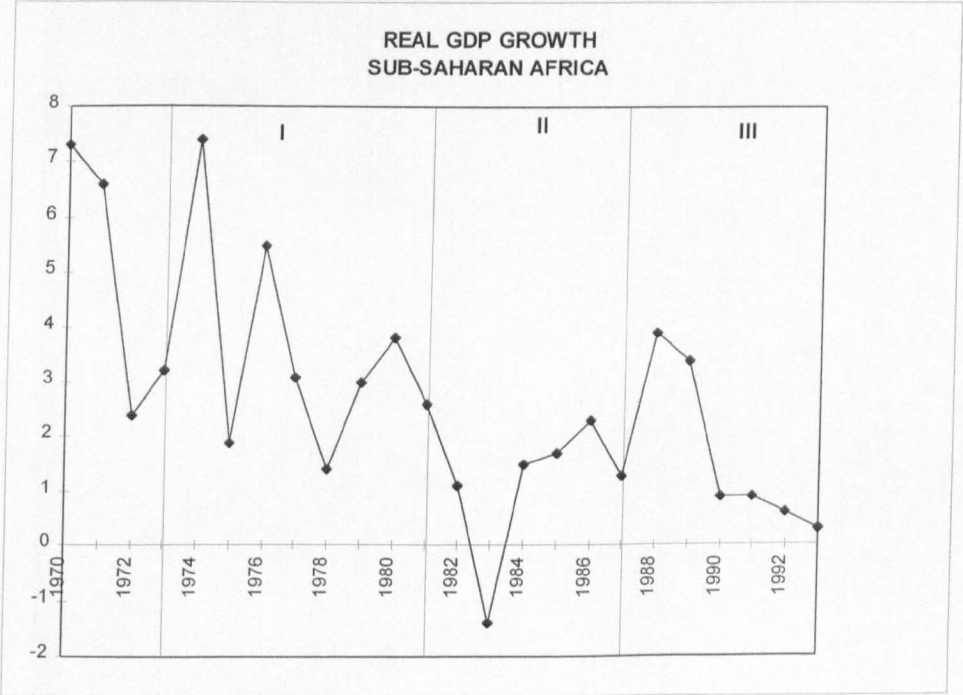
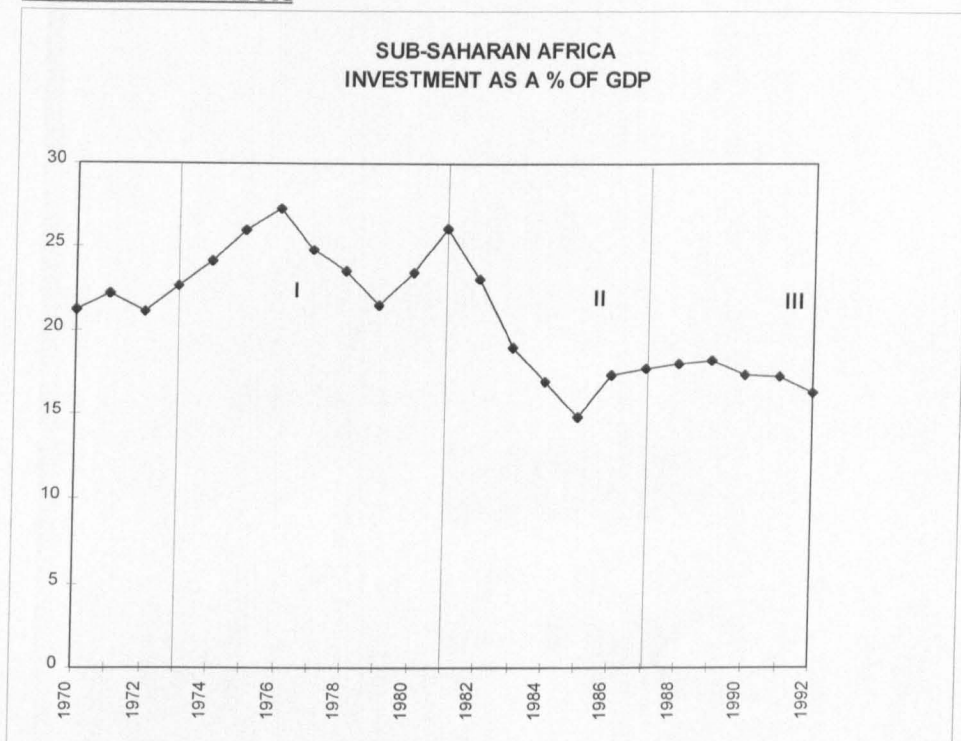
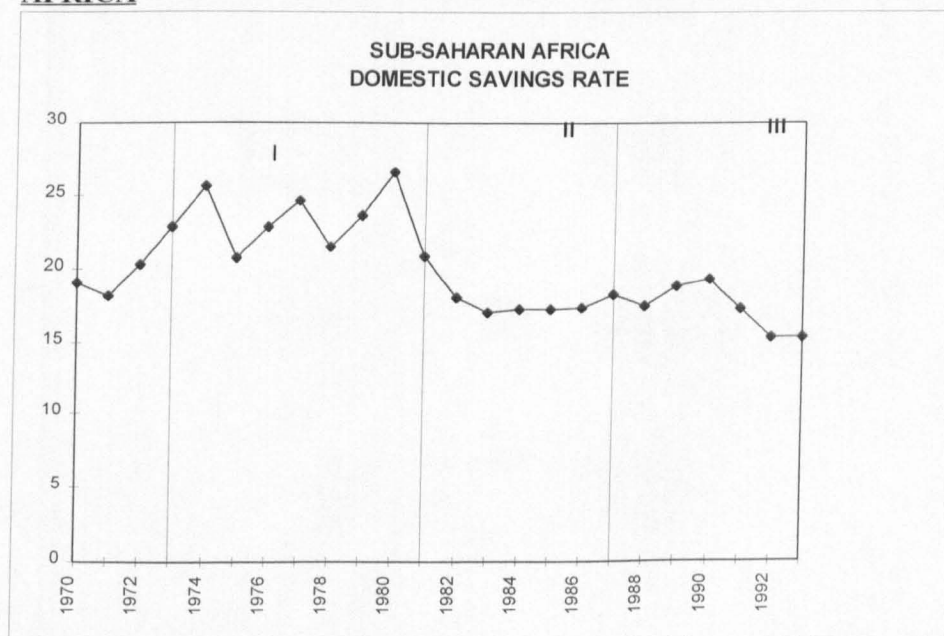


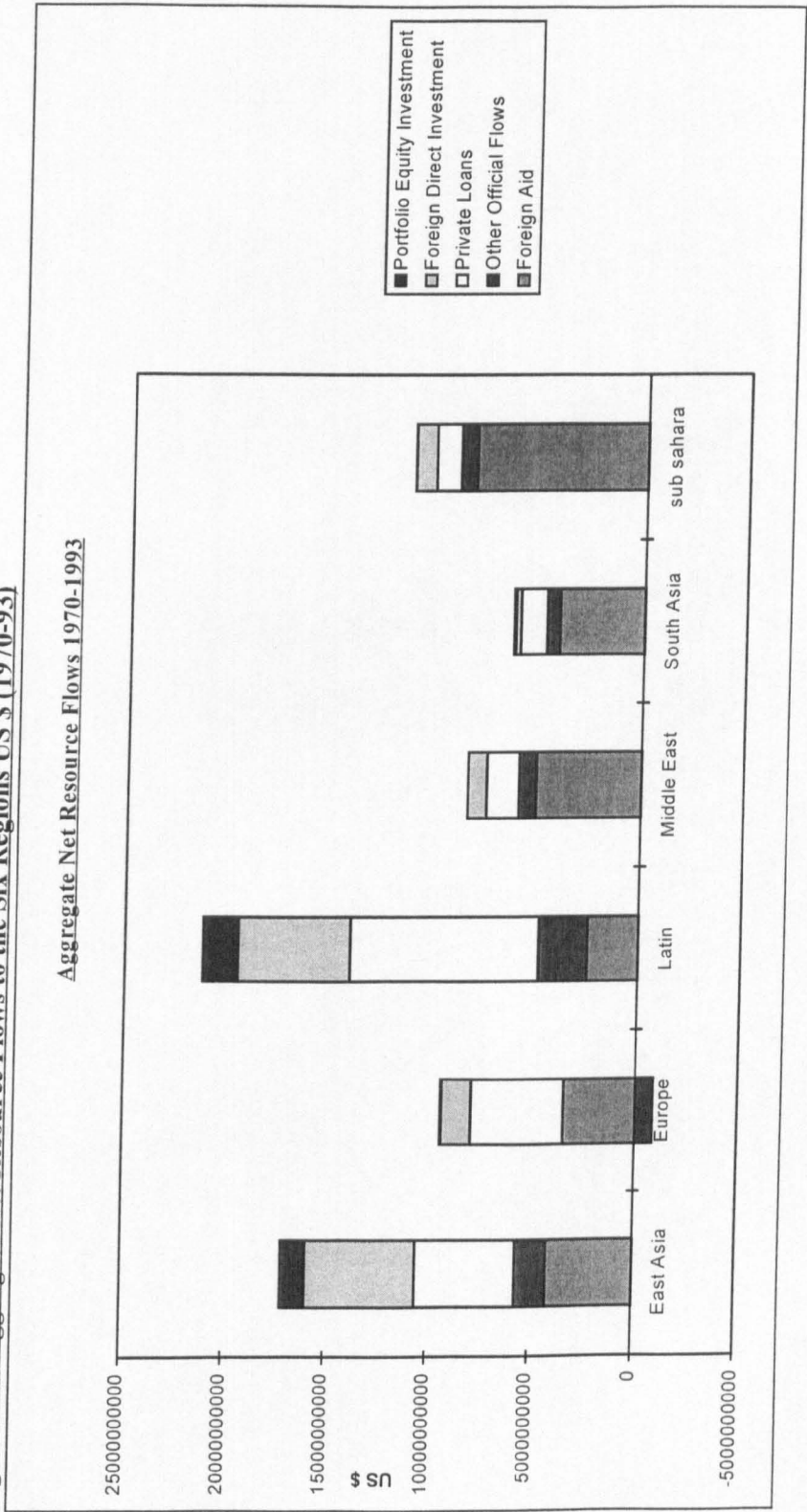
Figure 4.25: REAL GDP GROWTH IN SUB-SAHARAN AFRICA



**Figure 4.26: DOMESTIC INVESTMENT AS A % OF GDP IN SUB-SAHARAN AFRICA****Figure 4.27: DOMESTIC SAVINGS AS A % OF GDP IN SUB-SAHARAN AFRICA**

APPENDIX 4.2

Figure 4.28: Aggregate Net Resource Flows to the Six Regions US \$ (1970-93)



# Chapter Five

## Aid and Growth: A Statistical Analysis

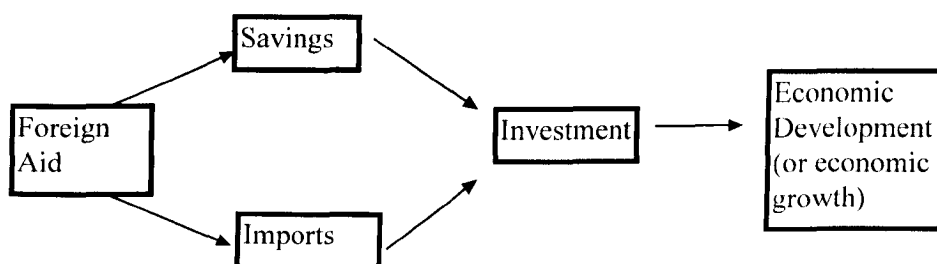
# **Chapter Five**

## **Aid and Growth: A Statistical Link**

### **5.1 Introduction**

From the donors' point of view, the main objective of official transfers to developing countries is to promote economic development and to enhance welfare. Policy makers are quite certain that economic development requires a substantial increase in national investment, that is an accelerated rate of capital formation. Another contention is that rapid economic development generally calls for a substantial volume of imports of materials, capital goods, and technical services. If either domestic savings are insufficient to finance domestic investment, or exports are inadequate to meet such imports, or both, rapid development cannot be attained. In such circumstances, the only way out is the substitution of foreign resources for the deficiency in domestic savings and/or exports. Chart 1 below describes this schematic link.

**Chart 1: A Schematic Link**



Donors expect that their resources are efficiently used, especially when it comes to foreign aid. What do they want in the end? In section 5.2 we start with a simple taxonomy about the link between aid and growth. This will enable us to understand better how aid is supposed to affect growth. It will also enable us to see whether others factors are important in explaining growth. In section 5.3 we then use a sample of developing countries to analyse statistically the link between aid and growth. This will tell us whether there is any association between these two variables. We also consider the investment

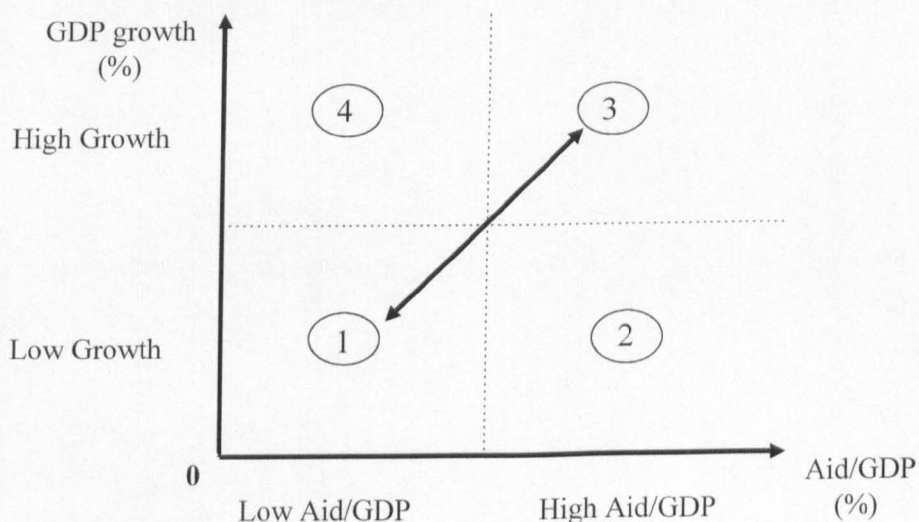


and savings rates to see if there are any further link. Section 5.4 concludes the chapter.

### 5.2 A Taxonomy for Aid and Growth

To start with, let us assume that a developing economy is in a steady (or in a shock-free) state and basing our argument on the fact that foreign aid causes growth (as described by the classical economists), then the economy in its early stage of development receiving low foreign aid as a proportion of its GDP will experience low growth of GDP. When high foreign aid/GDP is injected, then the donors would expect the recipient to move from the low growth state to some higher GDP growth. Figure 5.1 below depicts this simple argument showing that the recipient is in the beginning in the first quadrant with low foreign aid/GDP and low growth and which consequently moves to the third quadrant when the inflow increases. The argument can also be interpreted the other way round that if foreign aid falls then low growth will be observed, unless the economy has reached its self-sustaining growth level, this would imply moving from the third quadrant to the first one.

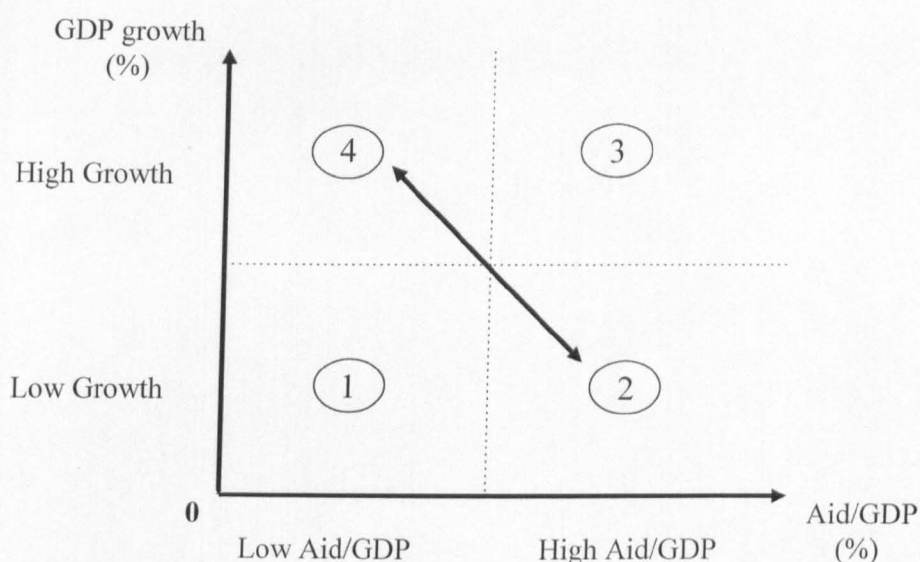
**Figure 5.1: Aid and Growth: A Direct Relationship**





Now if we take some of the propositions and findings of the recipient needs literature, the argument often runs that countries with low growth are bound to receive high foreign aid and those experiencing high growth will tend to receive low foreign aid/GDP. Here it is growth which causes foreign aid inflow. In such a case the recipient will find itself in the second or fourth quadrant as illustrated below in figure 5.2.

**Figure 5.2: Aid and Growth: An Inverse Relationship**

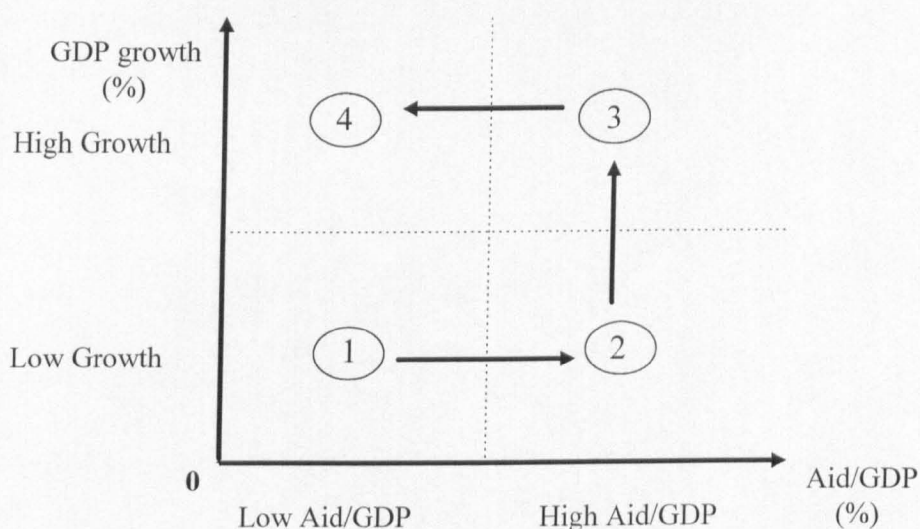


Putting both arguments together, a recipient can be anywhere in the four quadrants. Donors would normally expect their funds are efficiently used, so that at the end of the day the recipient will be able to maintain a high growth rate with some low inflow of resources. As Mosley and Hudson (1995) explain there is an “expected sequence” where the recipient moves in a counter clockwise direction starting with low aid/GDP and low growth as shown in figure 5.3 below.

Assuming that the economy under consideration is in steady state, it is expected that the recipient starts in the first quadrant initially with some low Aid/GDP (financing mainly basic infrastructure facilities) and then with time experiences some higher proportion of inflows, i.e., moving on to the second

quadrant. With high inflows the economy then starts to achieve a high rate of growth (quadrant three) and finally moves to the fourth quadrant where growth becomes sustainable with low Aid/GDP. This sequence then describes the effectiveness of foreign aid. One thing to point out though, as Mosley and Hudson put it, is that “good economic performance.....is not the same as high aid effectiveness” (pp. 18). Good economic performance could well be associated with a host of other factors.

**Figure 5.3: Mosley-Hudson Expected Sequence**



What is unknown in the process is the amount of time that the recipient spends in any particular quadrant. The transition will depend on the policies pursued by the recipient (for instance, trade policies, fiscal policies, and any other macroeconomic policies) and the effectiveness of foreign resources. Given this sequential pattern, we would be tempted to ask why developing countries have not so far experienced such a pattern after so many decades of foreign assistance? The most obvious answer would be because of the simplistic assumptions made concerning the state of the economy. The economy has been assumed to be isolated from international events, either from positive or negative shocks and internal problems which developing countries usually experience have been omitted.

Following this, we then argue that an economy, being in any of the quadrants, will be influenced by push and pull factors so that the economy moves to another quadrant. By push factors we mean those factors which push the economy into a favourable state (for example a positive external shock) and pull factors as those which force the economy to be located into an unfavourable state (for example the oil crisis which caused growth of many countries to fall sharply). We can hence combine figures 5.1, 5.2 and 5.3 to depict the consequence of push and pull factors. Figure 5.4 below depicts this with a positive sign (+) indicating a favourable event and a minus (-) indicating an unfavourable event. An economy can hence find itself in any one quadrant at some point but later can find itself located into another quadrant depending on the type of the shock.

**Figure 5.4: Aid and Growth: Effect of Shocks**

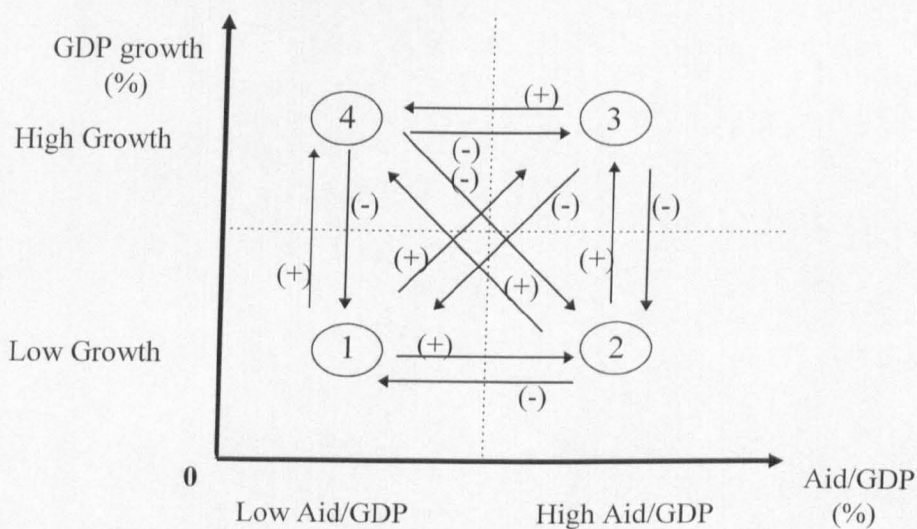


Table 5.1 below provides some possible explanation of how an economy can move from one quadrant to another.

**Table 5.1: Movement from one state to another.**

From	To	Possible Reasons
1	1	-Receiving low aid, no possibility to take-off.
1	2	-A sudden high inflow of foreign aid
1	3	-A sudden high inflows of foreign aid -A positive shock.
1	4	-A favourable shock (characterises especially countries with already established infrastructure)
2	1	-Fall in foreign aid
2	2	-Fungibility of foreign aid
2	3	-Favourable shock -Payoffs of high aid, investment in productive sectors leading to high growth.
2	4	-Favourable shock -Sound macroeconomic policies, repayment of debts
3	1	-Unfavourable shock -Fall in foreign aid leading to low growth -Internal domestic problems
3	2	-Unfavourable shock -Crowding out of private sectors -Fungibility of foreign aid -Internal domestic problems
3	4	-Sound macroeconomic policies -High effectiveness of foreign aid -Sustainable growth with low inflows of foreign aid
4	1	-Unfavourable shock -Fall in the productivity or effectiveness of foreign aid -Internal domestic problems
4	2	-Unfavourable shock -Growth not sustainable with low aid -Internal domestic problems
4	3	-Unfavourable shock -High aid is needed to sustain growth
4	4	- Sustainable growth with low aid

Growth sustainability is, of course, the main target of every country. In figure 5.3 what is probably missing is an explanation of how growth can be sustainable with low inflows of foreign aid. Many studies have, while testing the contribution of foreign aid, found private inflows to be more important (in

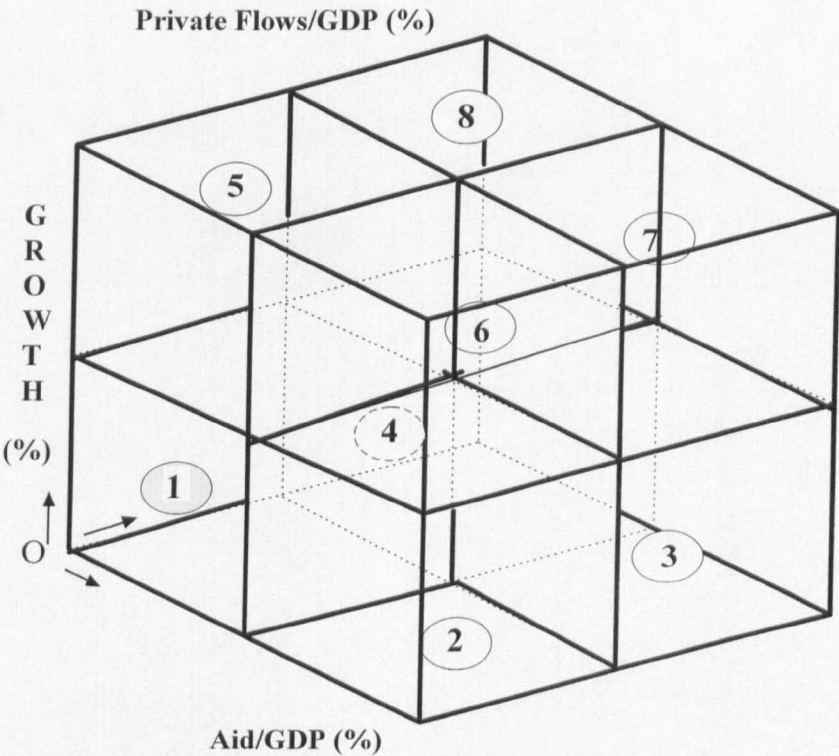
terms of higher coefficient and significance in regressions) for example, Papanek (1972), Mosley (1980), Gupta and Islam (1983), among others. Hence adding private inflows along with foreign aid gives a better picture of growth performance. This would help to understand cases where high foreign aid had led to poor growth performance because of a lack of private inflows (for instance foreign direct investment). This can also help depict a relationship between foreign aid and private flows, it could be the case that they might be complementary for growth to take place at an early stage of development yet to be substitutes in some later stage of development. This is because while foreign aid is mostly directed towards infrastructure (for example, roads construction, telecommunication, etc.), education and so on, where high rates of returns are obtained in the long run, on the other hand private inflows are mostly directed towards more immediately productive investment where returns are faster. But for private investment to take place some minimum level of infrastructure should be available to ensure this investment. Other hypotheses could be drawn when we add private inflows, for instance, private investors would like to invest in countries where aid flows are high just to be sure that basic infrastructures are in place (a complement case). In cases where the level of infrastructure is satisfactory private flows can substitute foreign aid for growth, for instance in the case of East Asian countries.

To incorporate private flows we will need to modify the two dimension figure into a three dimension one. When private flows are brought in it becomes difficult to suggest a sequential pattern as was suggested by Mosley and Hudson. In fact there is nothing as an “expected sequence” as they might suggest but a ‘preferred’ sequence which any donor or donor agencies would like recipients to follow while foreign aid is flowing in. A theory based on an expected sequence would be difficult as there are a host of factors affecting growth (see Levine and Renelt, 1992).

In figure 5.5 below, O is the origin and the growth rate of GDP is represented

on the vertical axis while foreign aid and private flows as a proportion of GDP are labelled on the horizontal axes as shown. The axes have been partitioned into two so that we can, as before, identify between ‘low’ and ‘high’ values of the respective variables. The figure thus has eight zones. Each zone depicts a country’s inflow of foreign aid, private inflows and growth. If a country is located in , for instance, Zone 1, then the country is characterised of having low growth, low aid and low private inflows.

Figure 5.5: Aid, Private Flows and Growth.



The descriptions of the zones are given in Table 5.2 below.

**Table 5.2: Description of Zones.**

Zone	Description	
1	low growth, low aid, low private flows	
2	low growth, high aid, low private flows	
3	low growth, high aid, high private flows	Fungibility? Crowding out?
4	low growth, low aid, high private flows	
5	high growth, low aid, low private flows	What are other factors?
6	high growth, high aid, low private flows	
7	high growth, high aid, high private flows	
8	high growth, low aid, high private flows	

From figure 5.5, if a country is located in zone 1 or 7, it would not be surprising given the ratio of aid and private flows, zone 7 however would be a preferred one to the recipient. If we observe that a country is 'stuck' for years in either zone 2 or 4 this could possibly imply that growth is restrained by the lower inflow. This could suggest that both inflows are complements and in such a case deficiency in either inflow can restrain growth. Following the same line of reasoning if a country is either in zone 6 or 8 this could imply that for the high growth performance one of the inflows is substituting the other.

Some controversial cases arise for instance, if a country is in zone 3 or 5. In zone 3 for instance, it implies that high aid together with high private inflows are not able to promote growth or that growth is constrained by other factors not described here. Fungibility also could well be an argument. Similarly for zone 5, given low inflows of aid and private flows, a high growth rate is observed. In this case we expect that factors like export, imports, quality of labour, etc. might well play an important part in explaining growth. These descriptions allow us to deduce that even the three dimension figure cannot satisfactorily explain growth, other factors as well are important. But one advantage of this diagram is that it allows us to cluster a group of countries together and to analyse each group and find out factors affecting growth in each

cluster. It is also helpful especially if one is conducting country case studies, one could take a country in a particular zone and compare it with another country in other zones. We might then be able to conclude about the effectiveness of foreign resources.

The above taxonomy has first shown that a relationship between aid and growth exists and second, that there are also a host of factors that can affect growth. In particular, it has been argued that external and internal economic conditions are potential factors that are responsible to affect growth and influence the aid-growth relationship. In the next section, we use a sample of developing countries to locate in which quadrant or zone most of these countries have been located.

### **5.3 A Preliminary Statistical Exercise**

In the previous chapter, the net resource transfers in different regions along with some macroeconomic indicators have been analysed and these have, at least, given some indication of a possible link between resource flows and growth performance. Now the intention is to trace out this link empirically on a group of developing countries. Out the 137 developing countries on the World Bank list, only 68 have been selected for the analysis. The countries are listed in the Appendix 5.1 at the end of the chapter. These include countries with population greater than one million in 1993 and those which have a data set on foreign resource transfers from 1970 to 1993. Some countries were excluded although they satisfied these criteria due to internal problems, for example civil war in cases like Mozambique, Guinea-Bissau, Nicaragua and Somalia. These countries have received very high amount of foreign resources, in some cases even as high as 55% of their GDP. If these countries are included in the sample it gives certain biases to the mean values.



As a preliminary exercise we have computed some statistics for the following variables for the period 1970-1993 in Appendix 5.2:

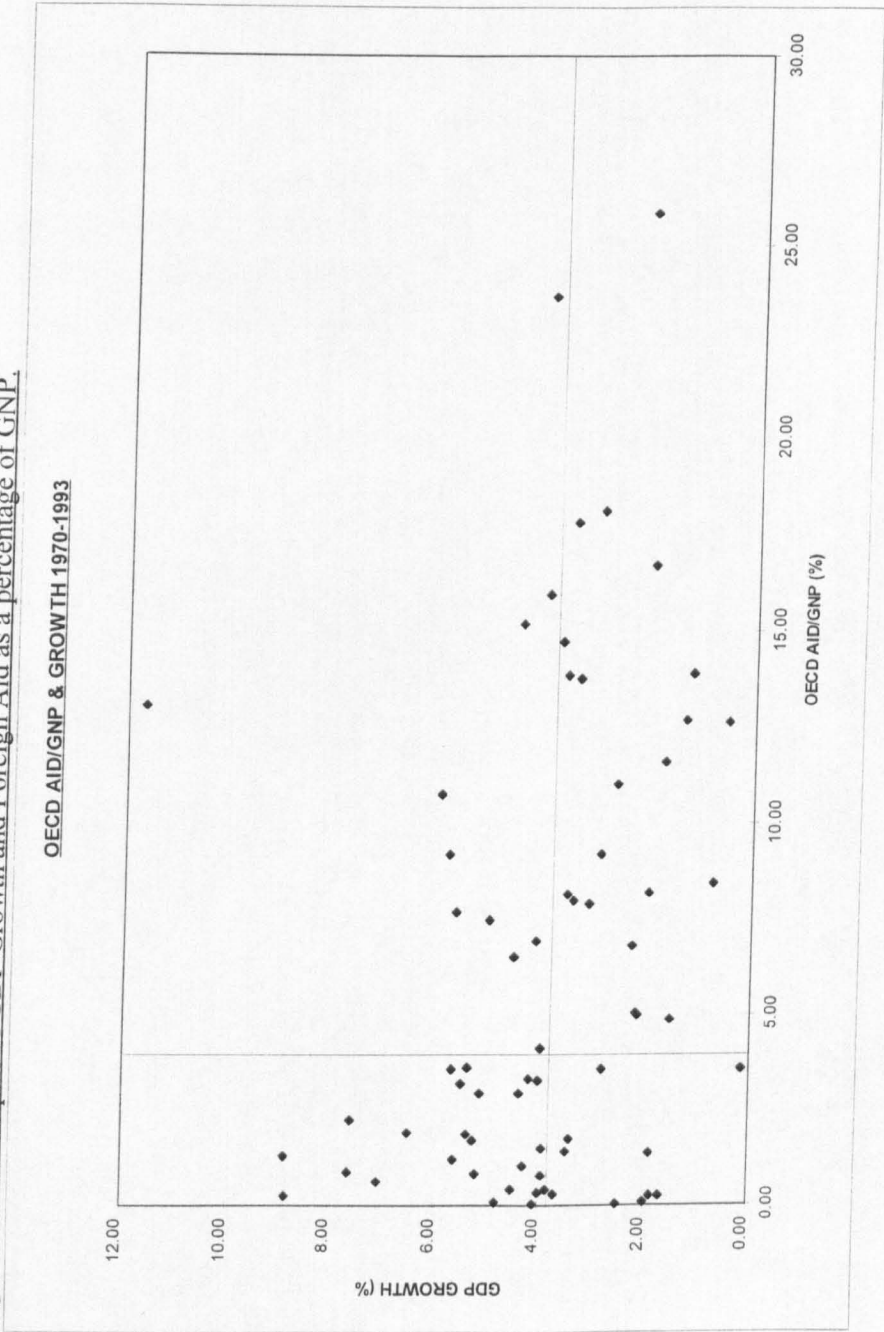
- (i) OECD Aid to GNP (OECD/GNP)
- (ii) Private flows to GNP (Priv/GNP)
- (iii) Domestic investment to GDP (Inv/GDP)
- (iv) Domestic savings to GDP (Sav/GDP)
- (v) Gross Domestic Product growth (growth)

All the data are in percentage terms. The mean, standard deviation and median are also computed.

### **5.3.1 Aid and Growth**

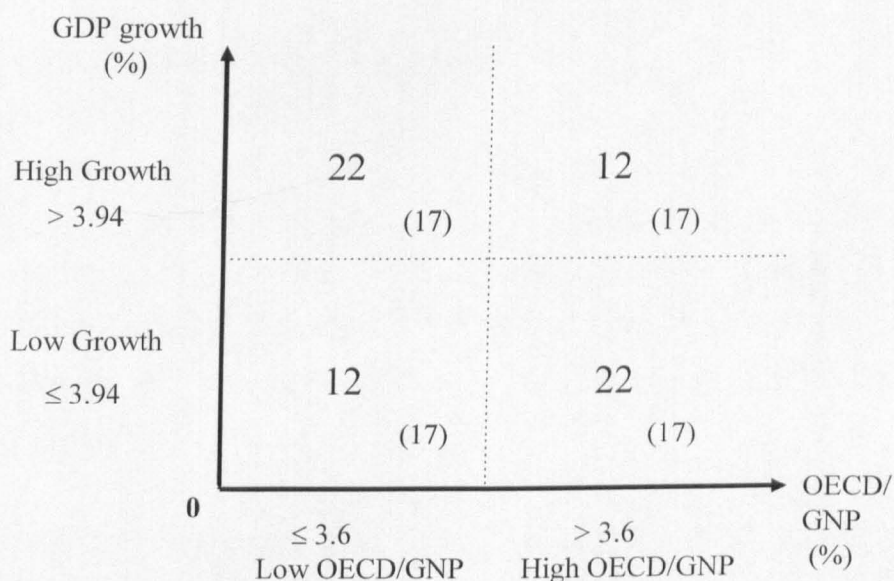
To begin with figure 5.6 depicts a scatter plot of the countries in the sample associated with their OECD aid inflows as a percentage of GNP and their GDP growth rates over the period 1970-1993. From the figure there is no doubt about the East Asian countries, for instance, China, Indonesia, Republic of Korea, Malaysia and Thailand, are among the high growth countries due to their recent surge in export performance. But their receipt of OECD/GNP flows are quite low. Would it be fair in these cases to suggest that low foreign aid causes high growth or that high growth is more likely to attract low foreign aid resources? Many would in this particular case agree with the latter statement. We can also observe that many Sub-Saharan African countries have received high foreign aid inflows but performed poorly in terms of growth, for instance, Chad, Madagascar, Mauritania, Niger, Togo, Senegal among others. Again in these cases we cannot just associate poor growth performance due to high foreign aid inflows only (other important factors have been outlined earlier). To clarify this argument we try to identify how many countries have achieved high growth with high aid, high growth with low aid, and so on.

Figure 5.6: Scatter plot of GDP Growth and Foreign Aid as a percentage of GNP.



The problem which we are confronted is to define 'high' and 'low' values. Some authors (Mosley (1987) and in World Bank studies) usually use the mean value to draw the distinction between high and low values. The mean often does not give a representative value due to extreme values at the end of the distribution. In this case a very common practice is to use the median instead of the mean. Defining thus all the values above the median as 'high' and those below or equal to the median as 'low', we can know the number of countries in each quadrant in terms of figure 5.3. The median values of OECD/GNP, Priv/GNP and GDP growth are 3.6, 1.82 and 3.94 respectively. Figure 5.7 depicts the number of countries in each quadrant.

**Figure 5.7: Number of Actual and Expected Countries in Each Quadrant**



Performing a chi-squared test to check if any relationship exists between growth and foreign aid indicates to us that there is some dependency between the two. The chi-squared test is given as:

$$\chi^2 = \sum \frac{(O - E)^2}{E}, \text{ where } O \text{ is the observed frequency and } E \text{ is the expected}$$

frequency (given in parentheses in figure 5.7), with  $(r-1)(c-1)$  degrees of freedom, where  $r$  and  $c$  are the number of rows and columns respectively. The calculated is  $\chi^2 = 5.88$  and the critical  $\chi^2$  value at 5% level is 3.84 with 1 degree of freedom. Hence a relationship does exist between growth and foreign aid. It would not be surprising by looking at figure 5.7 to deduce a negative relationship *per se*. But we cannot treat this result as causal, i.e., that low foreign aid causes low growth or that high aid causes low growth. It would be difficult to believe that low foreign aid inflows have caused high growth rates in 22 countries. If that is the case then it would be preferable to discourage foreign aid. Surely this hypothesis is not credible. One way to tackle this issue is to perhaps analyse these 22 countries by searching for factors responsible for growth, this can in turn allow one to decide when to start reducing the amount of foreign resources to a particular country.

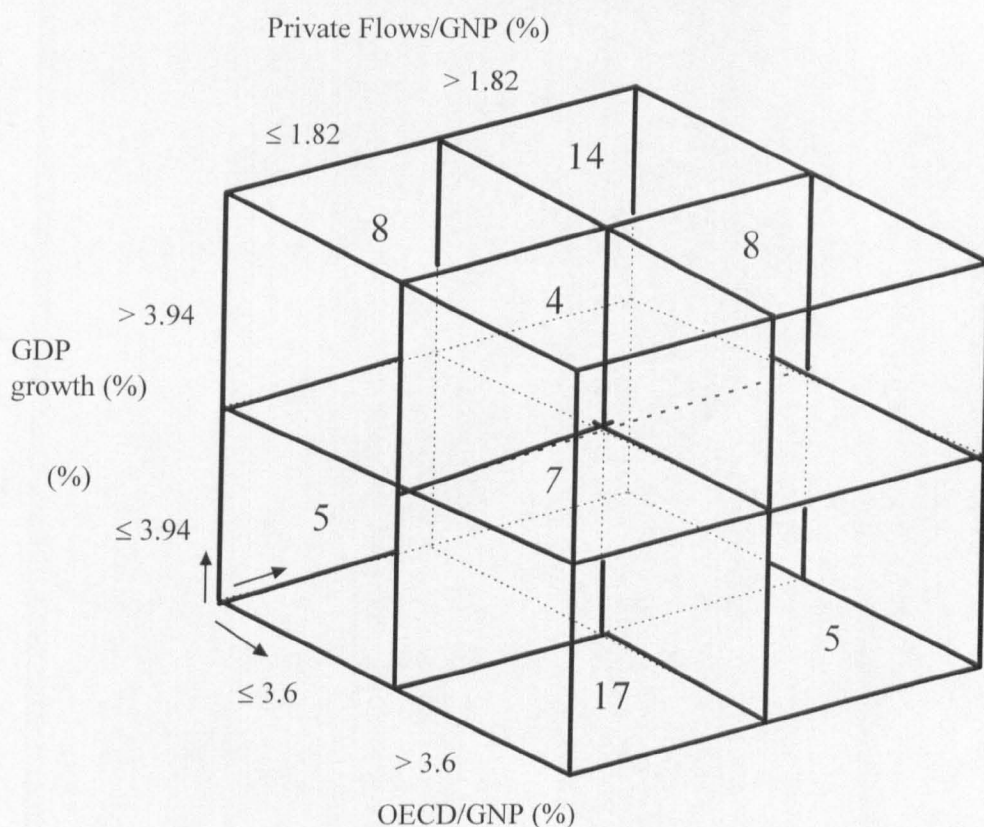
### **5.3.2 Aid, Private Flows and Growth**

As mentioned earlier to support our argument that a simple diagram like figure 5.7 cannot on its own deduce any causality we add another important variable in terms of private capital flows which are sought to be directed towards more productive activities and thereby increasing growth. Figure 5.8 below illustrates the three-dimensional diagram with the three variables as previously described.

Figure 5.8 tells a better story than figure 5.7, for instance, of the 22 countries which were observed to have high growth with low foreign aid, 14 (20.6% of the total sample) have experienced high private flows and only 8 low private flows as a ratio of GNP (of which China and Korea have received substantial absolute amounts in terms of Foreign Direct Investment). Of the other 22 countries which were classified as high aid and low growth in figure 5.7, 17 (25% of the total sample) have received low private flows on average during

the period 1970-1993. Clearly one can hypothesise that private flows are an important source of capital for achieving growth.

**Figure 5.8: Number of Countries in Each Zone**



The number of countries as classified in figure 5.8 are listed in Table 5.3 below. We can find good cases to suggest that private inflows are important for growth and they can be more effective in countries where the level of infrastructure is well developed. For instance take zone 8 which includes countries like Brazil, Gabon, Indonesia, Malaysia, Mexico and Thailand and zone 2 which mostly includes Sub-Saharan African countries facing a below threshold level of infrastructure to encourage private inflows as one of the factors.

In the above analysis we have seen that foreign capital flows can explain growth performance but there are instances where these flows cannot fully account for growth for e.g. in zone 5. In this context we need also to analyse domestic sources of capital, mainly, domestic savings.

**Table 5.3: List of Countries in Each Zone.**

Zone	Characteristics	No. of countries	Countries
1	Low Growth, Low Aid and Low Private Flows	5	Guatemala, Nigeria, Philippines, Venezuela, Zaire
2	Low Growth, High Aid and Low Private Flows	17	Bangladesh, Benin, Burkina Faso, Central African Republic, El Salvador, Ghana, Jamaica, Madagascar, Mali, Mauritania, Nepal, Niger, Rwanda, Senegal, Sierra Leone, Sudan, Tanzania.
3	Low Growth, High Aid and High Private Flows	5	Bolivia, Chad, Papua New Guinea, Togo, Zambia.
4	Low Growth, Low Aid and High Private Flows	7	Argentina, Cote d'Ivoire, Panama, Peru, Portugal, Trinidad and Tobago, Uruguay.
5	High Growth, Low Aid and Low Private Flows	8	China, India, Korea, Mauritius, Pakistan, Paraguay, Turkey, Zimbabwe.
6	High Growth, High Aid and Low Private Flows	4	Burundi, Malawi, Sri Lanka, Syrian Arab Republic.
7	High Growth, High Aid and High Private Flows	8	Botswana, Cameroon, Congo, Egypt, Gambia, Honduras, Kenya, Tunisia.
8	High Growth, Low Aid and High Private Flows	14	Algeria, Brazil, Chile, Columbia, Costa Rica, Dominican Republic, Ecuador, Gabon, Indonesia, Malaysia, Mexico, Morocco, Oman, Thailand.

**5.3.3 Aid, Private Flows, Savings, Investment and Growth.**

Three-dimensional framework described earlier implicitly suggests that a regression model where growth is regressed only on foreign aid is misleading. Even incorporating other resource flows such as private flows will not suffice, for instance in zone 5 where some countries still achieve high growth with low aid and low private flows. Other factors also come into play for instance domestic savings, domestic investment, the extent of fiscal and macro imbalances, and so on. Because it would be practically impossible to simultaneously represent these in one diagram we try to analyse other sources of capital: domestic savings. We consider the other factors when we perform regression analysis.

To understand better the link between the variables, we take different growth intervals and see the associated rates of foreign aid, private flows, domestic savings and investment. In the first instance we analyse average rates of OECD aid flows, private flows, domestic investment and domestic savings for countries having growth rates below the median at different growth intervals. This will enable us to compare some essential characteristics among the ‘low’ growth achievers. Table 5.4 below shows these.

**Table 5.4: Countries below the median growth value of 3.94 with growth intervals (averages)**

<b>Interval</b>	<b>Growth Rate</b>	<b>OECD/ GNP</b>	<b>Priv/GNP</b>	<b>Inv/GDP</b>	<b>Sav/GDP</b>	<b>n</b>
$0 \leq Y^1 < 1$	0.48	8.22	1.19	13.00	7.57	3
$1 \leq Y < 2$	1.68	7.74	2.40	18.86	14.41	9
$2 \leq Y < 3$	2.46	8.47	1.42	18.57	12.74	10
$Y \geq 3$	3.56	7.45	2.09	19.97	12.20	12
<b>Mean</b>	<b>2.47</b>	<b>7.90</b>	<b>1.89</b>	<b>18.65</b>	<b>12.53</b>	

<sup>1</sup> Y is the percentage growth rate of GDP. 158

The second column in the table gives the average economic growth rates for countries between the interval values in column one, for instance in row one, 3 countries have on average growth rates around 0.5% and have received aid around 8% of GNP. On average the countries below the median growth value have domestic investment and domestic savings rates of around 19% and 13% respectively. The figures in the table show that countries with low domestic savings and investment ratios are associated with low growth. As these rates increase, the growth performance also increases.

We can also analyse the link between these variables by taking different foreign aid flows intervals and see the associated rates of private flows, domestic savings, investment and growth. This is performed in Table 5.5 below.

**Table 5.5: Countries below the median growth value of 3.94 with Aid intervals (averages).**

Interval	OECD/ GNP	Priv/GNP	Inv/GDP	Sav/GDP	Growth	n
$X^2 < 1$	0.22	2.65	22.52	23.22	2.6	6
$1 \leq X < 3$	1.51	2.45	21.13	19.26	3.19	4
$3 \leq X < 6$	4.43	1.61	16.51	14.00	1.77	5
$6 \leq X < 9$	7.92	0.93	14.01	7.74	2.52	6
$9 \leq X < 12$	10.57	2.15	18.30	9.66	2.41	3
$12 \leq X < 15$	13.57	2.50	17.84	7.96	2.29	6
$X \geq 15$	19.60	0.91	21.34	4.16	2.65	4

The above table has some important features, for instance, countries with high private inflows, high domestic investment, high domestic savings and high growth rates have received on average foreign aid less than 3%. Notice also that countries which achieved relatively higher growth, for instance around 2.65% (the last row in Table 5.5) despite having low domestic savings rates

<sup>2</sup> X is the percentage of OECD/GNP.



(4.16%) have a high domestic investment rate (21.34%). This depicts a case where foreign aid and/or private flows supplement domestic savings.

Repeating the same sort of analysis for countries above the median growth value (i.e. for high growth achievers), Table 5.6 gives a much clearer picture than Tables 5.4 and 5.5. It can be found that higher growth rates are associated with higher domestic savings, higher domestic investment and higher private inflows. Aid dependency falls in this category as growth rates become higher. Countries with growth rates greater than 6.5% are China, Botswana, Malaysia, Oman and Thailand. They almost all have investment and saving rates as high as 30%.

**Table 5.6: Countries above the median growth value of 3.94 with growth intervals (averages)**

Interval	Growth Rate	OECD/ GNP	Priv/ GNP	Inv/ GDP	Sav/ GDP	n
$3.5 \leq Y < 4.5$	4.14	6.47	2.20	22.09	17.41	12
$4.5 \leq Y < 5.5$	5.03	2.83	2.40	24.26	22.12	9
$5.5 \leq Y < 6.5$	5.83	5.36	2.97	23.47	17.83	7
$Y \geq 6.5$	8.62	3.06	3.25	30.48	31.53	6
<b>Mean</b>	<b>5.51</b>	<b>4.68</b>	<b>2.60</b>	<b>24.43</b>	<b>21.23</b>	

Note that the mean values for domestic investment, domestic savings and private flows for all the countries above the median growth rate are higher than those below the median growth.

If we perform the same kind of analysis for this group of countries as in Table 5.5, we can find that countries with lower savings rates have received a higher aid inflow, see Table 5.7 below. Concerning the growth achievements, even though there are cases where foreign aid is less than 1%, growth rates are high due to high private inflows, high domestic investment and high savings rates.

And in cases where the growth rate is high, for instance the last row, despite a low savings rate, foreign aid investment and domestic investment is seen to be mostly responsible for such high growth.

**Table 5.7: Countries above the median growth value of 3.94 with Aid intervals (averages)**

Interval	OECD/ GNP	Priv/ GNP	Inv/GDP	Sav/GDP	Growth	n
$0 \leq X < 1$	0.47	3.14	25.81	25.30	5.56	9
$1 \leq X < 3$	1.91	2.90	25.89	27.17	5.89	9
$3 \leq X < 6$	3.53	1.58	22.73	18.18	4.81	6
$6 \leq X < 9$	7.15	3.29	23.68	17.77	4.84	4
$X \geq 9$	14.63	1.88	22.38	11.59	6.00	6

From the above analysis one clear implication is that high growth is observed either when domestic savings is high and foreign aid is low or when domestic savings is low and foreign aid is high. But without any doubt growth performance is better when domestic investment rates are high. It can be seen that investment rates of around 20% generates growth rates around 3.5% while rates between 22% to 25% can achieve growth in the region of 5% or more.

Because the sample was divided using growth rates (above and below the median value) in each category there would be inclusion of countries with high and low GNP per capita. Normally one would expect a lower income country to save less than a higher income counterpart. In this context we approach another way by dividing the sample into low-income and middle-income countries. This will also check the robustness of the above hypotheses. The countries classified as low-income are those in which 1993 GNP per capita was no more than \$695 and middle-income are those in which GNP per capita was more than \$695 but less than \$8,626 (World Bank, 1994). The list of countries in each group are given in Appendix 5.3 and 5.4 respectively.

Table 5.8 produces statistics for low-income countries in a similar fashion as in the previous tables. Here again poor growth performance is associated with low domestic investment and domestic savings rates, low inflows of private flows and foreign aid (observe the first row in Table 5.8). We can still notice that higher growth rates are associated with higher investment and savings rates.

**Table 5.8: Low-income countries with growth intervals (averages)**

Interval	Growth Rate	OECD/ GNP	Priv/ GNP	Inv/ GDP	Sav/ GDP	n
$0 \leq Y < 1$	0.48	8.22	1.19	13.00	7.57	3
$1 \leq Y < 2$	1.94	12.59	2.20	16.82	8.90	5
$2 \leq Y < 3$	2.61	12.36	1.39	17.87	8.35	5
$3 \leq Y < 4$	3.49	9.97	0.66	17.60	7.79	7
$4 \leq Y < 5$	4.22	10.36	1.07	19.64	12.71	7
$Y \geq 5$	6.35	5.12	1.88	24.27	18.52	4
<b>Mean</b>	<b>3.29</b>	<b>10.07</b>	<b>1.33</b>	<b>18.39</b>	<b>10.53</b>	

There is no clear cut indication about private flows, as the growth rate interval gets higher, private flows are quite low. This suggests that private investors select particular countries in deciding where to invest, not particularly growth rates. This is not surprising as investors would prefer to invest where returns are high, the country is politically stable, where there are less fiscal and macro imbalances and so on. The level of income also plays an important role as this could ensure a higher demand for goods and services produced in the local economy. One of the obvious factors is that countries which have growth rates less than 3% have higher foreign aid inflows. This could be due to the low level of income, high level of poverty and low propensity to save in these countries. Countries which perform well in this group, for example with growth greater than 5%, have the highest investment and savings rates and the lowest foreign aid inflows of 5.12%.

Looking from the foreign aid angle as depicted in Table 5.9 below, it seems clear here also that countries with low savings have received higher foreign aid inflows. Whether low foreign aid is associated with high growth, or high aid is connected with low growth is not obvious.

**Table 5.9: Low-income countries with aid intervals**

Interval	OECD/ GNP	Priv/ GNP	Inv/ GDP	Sav/ GDP	Growth	n
$0 \leq X < 3$	0.59	1.24	24.25	24.36	5.67	3
$3 \leq X < 6$	3.82	1.36	16.25	14.21	2.98	5
$6 \leq X < 9$	7.70	1.08	16.49	9.95	3.32	8
$9 \leq X < 12$	9.98	2.94	21.34	11.53	3.48	3
$12 \leq X < 15$	13.34	1.27	16.55	6.45	2.00	5
$X \geq 15$	19.02	0.97	19.64	5.13	3.30	7

For middle-income countries, private flows are higher than low income countries (Table 5.10). This also supports the evidence that private investors select countries with higher levels of GNP. Again we can find the same outcome that at higher growth intervals domestic investment and savings are higher together with private flows. Notice that foreign aid inflows for middle income countries are lower than the low income countries which was observed in Chapter 1 when we analysed trends and sources of net resource flows.

As in Table 5.9, a similar analysis in Table 5.11 for middle income countries suggests that countries with low savings receive higher foreign aid. Even within this group we can justify the point made earlier that when high growth and high investment rates are observed, either a high savings rate as high as the investment rate or a low savings rate and a high aid/GNP ratio tend to be associated. This suggests that foreign aid is fulfilling its job in terms of supplementing domestic savings to match the domestic investment rate

(observe rows 1 and 5 in Table 5.11).

**Table 5.10: Middle-income countries with growth intervals (averages)**

Interval	Growth Rate	OECD/ GNP	Priv/ GNP	Inv/ GDP	Sav/ GDP	n
$1 \leq Y < 2$	1.75	1.69	2.63	21.41	21.29	4
$2 \leq Y < 3$	2.31	4.58	1.45	19.27	17.13	5
$3 \leq Y < 4$	3.75	2.97	4.08	24.69	20.91	7
$4 \leq Y < 5$	4.34	1.84	2.75	22.33	20.19	6
$5 \leq Y < 6$	5.39	2.88	3.41	25.98	23.50	8
$Y \geq 6$	7.90	4.40	3.06	28.28	27.90	7
<b>Mean</b>	<b>4.58</b>	<b>3.12</b>	<b>3.01</b>	<b>24.18</b>	<b>22.20</b>	

**Table 5.11: Middle-income countries with aid intervals (averages)**

Interval	OECD/ GNP	Priv/ GNP	Inv/ GDP	Sav/ GDP	Growth	n
$0 \leq X < 1$	0.38	3.16	24.34	24.16	4.08	13
$1 \leq X < 2$	1.56	2.44	23.11	21.16	4.93	9
$2 \leq X < 4$	3.06	3.26	27.08	28.03	5.38	6
$4 \leq X < 7$	5.22	1.62	20.23	16.66	2.50	4
$X \geq 7$	11.44	4.49	25.35	16.43	5.93	5

In the middle income group and above the median growth category some evidence is present to support the hypothesis that foreign aid supplements domestic savings. For the low-income group and below median growth category, countries which have achieved high growth rates are those which have managed to have high savings and investment rates. For the low income countries there are cases where it seems that foreign aid is fungible, leaking towards consumption without supplementing the low domestic savings rates due to low levels of GNP. However, whether aid is fungible is not clear as we have not encountered cases where high aid inflows associated with low savings

are associated with low investment rates.

### **5.4 Conclusion**

The simple taxonomy depicting the relationship between aid and growth has shown that the expected sequence can be disturbed by external economic events. This relationship is also further affected by domestic economic conditions. In this context aid effectiveness can be affected depending on the conditions in place. The three dimensional diagram has indicated that the simple aid-growth relationship hides other factors which can explain growth performance. Analysing only the different sources of capital statistically, it is found that low savings rates are associated with high foreign aid inflows. For the sample we did not find cases where aid can be thought of as being fungible. Fungibility would have been observed if high foreign aid inflows in the presence of low savings were associated with low investment and growth rates. This, however, was not found. These preliminary statistical exercises have been informative. They suggest that there is a host of factors that explain growth and studies which have not controlled for such factors might have led to misleading conclusions on aid's effectiveness. Before we bring out the factors that explain growth, we review some of the empirical studies in the aid-growth literature in the next chapter. This will help us in specifying a model capable of explaining growth and overcome the shortcomings in previous studies.

**APPENDIX 5.1: List of countries included in the sample.**

Algeria	Malaysia
Argentina	Mali
Bangladesh	Mauritania
Benin	Mauritius
Bolivia	Mexico
Botswana	Morocco
Brazil	Nepal
Burkina Faso	Niger
Burundi	Nigeria
Cameroon	Oman
Central African Republic	Pakistan
Chad	Panama
Chile	Papua New Guinea
China	Paraguay
Colombia	Peru
Congo	Philippines
Costa Rica	Portugal
Cote d'Ivoire	Rwanda
Dominican Republic	Senegal
Ecuador	Sierra Leone
Egypt	Sri Lanka
El Salvador	Sudan
Gabon	Syrian Arab Republic
Gambia, The	Tanzania
Ghana	Thailand
Guatemala	Togo
Honduras	Trinidad and Tobago
India	Tunisia
Indonesia	Turkey
Jamaica	Uruguay
Kenya	Venezuela
Korea, The Republic	Zaire
Madagascar	Zambia
Malawi	Zimbabwe

**APPENDIX 5.2: Average Values for the period 1970-1993.**

Countries	oecd/ gnp	priv/gnp	inv/gdp	sav/gdp	growth
Algeria	0.80	3.48	36.45	34.52	3.95
Argentina	0.07	2.26	21.80	23.46	2.00
Bangladesh	7.97	0.06	11.51	2.66	3.42
Benin	9.18	1.59	15.02	2.23	2.92
Bolivia	6.81	2.00	18.09	15.89	2.29
Botswana	13.09	3.76	36.78	27.70	11.66
Brazil	0.08	2.92	21.50	22.00	4.80
Burkina Faso	13.81	0.27	20.68	0.72	3.60
Burundi	15.16	0.13	13.31	2.53	4.47
Cameroon	4.15	2.08	22.94	21.84	4.01
Central African Republic	13.88	1.19	12.82	0.27	1.19
Chad	16.66	1.96	11.54	5.73	1.99
Chile	0.32	4.65	19.90	19.95	3.99
China	0.23	1.44	32.39	32.81	8.85
Colombia	0.43	1.83	19.16	20.24	4.50
Congo	7.67	8.08	28.78	22.06	5.67
Costa Rica	2.99	3.91	25.14	19.92	4.40
Cote d'Ivoire	3.58	3.99	18.51	22.06	2.82
Dominican Republic	1.72	2.32	22.38	16.81	5.26
Ecuador	1.21	4.04	22.05	21.69	5.61
Egypt	9.19	3.59	23.63	11.67	5.81
El Salvador	5.01	0.68	15.76	10.03	2.17
Gabon	2.95	6.01	37.67	48.20	5.13
Gambia, The	23.63	1.83	16.81	4.88	4.03
Ghana	5.07	0.49	10.08	7.21	2.21
Guatemala	1.43	1.55	15.24	11.88	3.50
Honduras	6.93	2.14	20.59	15.58	4.13
India	1.05	0.59	21.85	20.21	4.31
Indonesia	1.91	2.61	25.63	28.11	6.48
Jamaica	4.90	1.70	24.14	18.89	1.52
Kenya	7.48	1.98	23.32	20.02	5.02
Korea, The Republic	1.28	1.69	30.06	27.91	8.87
Madagascar	8.45	0.81	10.50	3.60	0.77
Malawi	15.93	1.21	22.02	11.89	4.01
Malaysia	0.64	6.50	29.05	31.84	7.07
Mali	18.10	0.36	18.34	1.25	2.98
Mauritania	25.84	0.51	27.39	8.98	2.12
Mauritius	3.21	1.19	24.69	20.86	5.52
Mexico	0.06	3.18	21.84	21.82	4.08
Morocco	3.33	2.57	23.42	15.30	4.22



**APPENDIX 5.2 (continued): Average Values for the period 1970-1993.**

Nepal	8.16	0.14	16.44	9.50	3.55
Niger	12.63	1.58	14.44	7.34	0.51
Nigeria	0.42	1.67	18.49	20.07	3.84
Oman	2.24	3.41	24.82	42.79	7.60
Pakistan	3.59	0.52	17.74	9.58	5.70
Panama	1.50	4.53	23.45	23.02	3.94
Papua New Guinea	14.69	8.60	24.89	15.53	3.73
Paraguay	1.87	1.55	23.36	18.91	5.39
Peru	1.36	1.90	21.46	20.20	1.91
Philippines	1.76	1.80	24.38	21.93	3.42
Portugal	0.30	3.95	28.55	19.53	3.71
Rwanda	13.73	0.76	13.43	3.67	3.38
Senegal	10.97	1.23	14.50	6.05	2.60
Sierra Leone	8.19	1.66	12.98	7.61	1.99
Sri Lanka	6.51	0.97	22.02	13.44	4.54
Sudan	7.91	0.90	14.56	7.20	3.14
Syrian Arab Republic	10.76	0.77	21.79	10.84	6.00
Tanzania	17.78	0.79	28.08	12.14	3.50
Thailand	0.87	2.67	29.81	26.12	7.64
Togo	11.56	3.64	25.37	20.69	1.70
Trinidad and Tobago	0.25	4.32	23.32	28.89	1.69
Tunisia	3.62	2.49	26.75	21.10	5.38
Turkey	0.82	1.57	22.18	18.36	5.19
Uruguay	0.25	2.61	16.73	17.16	1.86
Venezuela	0.04	1.10	26.20	30.22	2.50
Zaire	3.59	1.19	14.08	11.78	0.15
Zambia	12.65	2.57	21.40	21.68	1.31
Zimbabwe	3.29	0.59	20.85	20.41	4.03
<b>Mean</b>	<b>6.29</b>	<b>2.25</b>	<b>21.54</b>	<b>16.88</b>	<b>3.99</b>
<b>Standard Deviation</b>	<b>6.15</b>	<b>1.74</b>	<b>6.14</b>	<b>10.13</b>	<b>2.07</b>
<b>Median</b>	<b>3.60</b>	<b>1.82</b>	<b>21.85</b>	<b>18.90</b>	<b>3.94</b>
<b>No. of countries</b>	<b>68</b>				

**APPENDIX 5.3: Low-income countries (Averages for the period 1970-93).**

Countries	oecd/ gnp	priv/gnp	inv/gdp	sav/gdp	growth
Bangladesh	7.97	0.06	11.51	2.66	3.42
Benin	9.18	1.59	15.02	2.23	2.92
Burkina Faso	13.81	0.27	20.68	0.72	3.60
Burundi	15.16	0.13	13.31	2.53	4.47
Central African Republic	13.88	1.19	12.82	0.27	1.19
Chad	16.66	1.96	11.54	5.73	1.99
China	0.23	1.44	32.39	32.81	8.85
Cote d'Ivoire	3.58	3.99	18.51	22.06	2.82
Egypt	9.19	3.59	23.63	11.67	5.81
Gambia, The	23.63	1.83	16.81	4.88	4.03
Ghana	5.07	0.49	10.08	7.21	2.21
Honduras	6.93	2.14	20.59	15.58	4.13
India	1.05	0.59	21.85	20.21	4.31
Kenya	7.48	1.98	23.32	20.02	5.02
Madagascar	8.45	0.81	10.50	3.60	0.77
Malawi	15.93	1.21	22.02	11.89	4.01
Mali	18.10	0.36	18.34	1.25	2.98
Mauritania	25.84	0.51	27.39	8.98	2.12
Nepal	8.16	0.14	16.44	9.50	3.55
Niger	12.63	1.58	14.44	7.34	0.51
Nigeria	0.42	1.67	18.49	20.07	3.84
Pakistan	3.59	0.52	17.74	9.58	5.70
Rwanda	13.73	0.76	13.43	3.67	3.38
Sierra Leone	8.19	1.66	12.98	7.61	1.99
Sri Lanka	6.51	0.97	22.02	13.44	4.54
Sudan	7.91	0.90	14.56	7.20	3.14
Tanzania	17.78	0.79	28.08	12.14	3.50
Togo	11.56	3.64	25.37	20.69	1.70
Zaire	3.59	1.19	14.08	11.78	0.15
Zambia	12.65	2.57	21.40	21.68	1.31
Zimbabwe	3.29	0.59	20.85	20.41	4.03
<b>Mean</b>	<b>10.07</b>	<b>1.33</b>	<b>18.39</b>	<b>10.53</b>	<b>3.29</b>
<b>Standard Deviation</b>	<b>6.31</b>	<b>1.02</b>	<b>5.50</b>	<b>8.46</b>	<b>1.74</b>
<b>No. of countries</b>	<b>31</b>				

**APPENDIX 5.4: Middle-income countries (Averages for the period 1970-93).**

Countries	oecd/ gnp	priv/gnp	inv/gdp	sav/gdp	growth
Algeria	0.80	3.48	36.45	34.52	3.95
Argentina	0.07	2.26	21.80	23.46	2.00
Bolivia	6.81	2.00	18.09	15.89	2.29
Botswana	13.09	3.76	36.78	27.70	11.66
Brazil	0.08	2.92	21.50	22.00	4.80
Cameroon	4.15	2.08	22.94	21.84	4.01
Chile	0.32	4.65	19.90	19.95	3.99
Colombia	0.43	1.83	19.16	20.24	4.50
Congo	7.67	8.08	28.78	22.06	5.67
Costa Rica	2.99	3.91	25.14	19.92	4.40
Dominican Republic	1.72	2.32	22.38	16.81	5.26
Ecuador	1.21	4.04	22.05	21.69	5.61
El Salvador	5.01	0.68	15.76	10.03	2.17
Gabon	2.95	6.01	37.67	48.20	5.13
Guatemala	1.43	1.55	15.24	11.88	3.50
Indonesia	1.91	2.61	25.63	28.11	6.48
Jamaica	4.90	1.70	24.14	18.89	1.52
Korea, The Republic	1.28	1.69	30.06	27.91	8.87
Malaysia	0.64	6.50	29.05	31.84	7.07
Mauritius	3.21	1.19	24.69	20.86	5.52
Mexico	0.06	3.18	21.84	21.82	4.08
Morocco	3.33	2.57	23.42	15.30	4.22
Oman	2.24	3.41	24.82	42.79	7.60
Panama	1.50	4.53	23.45	23.02	3.95
Papua New Guinea	14.69	8.60	24.89	15.53	3.73
Paraguay	1.87	1.55	23.36	18.91	5.39
Peru	1.36	1.90	21.46	20.20	1.91
Philippines	1.76	1.80	24.38	21.93	3.42
Portugal	0.30	3.95	28.55	19.53	3.71
Senegal	10.97	1.23	14.50	6.05	2.60
Syrian Arab Republic	10.76	0.77	21.79	10.84	6.00
Thailand	0.87	2.67	29.81	26.12	7.64
Trinidad and Tobago	0.25	4.32	23.32	28.89	1.69
Tunisia	3.62	2.49	26.75	21.10	5.38
Turkey	0.82	1.57	22.18	18.36	5.19
Uruguay	0.25	2.61	16.73	17.16	1.86
Venezuela	0.04	1.10	26.20	30.22	2.50
<b>Mean</b>	<b>3.12</b>	<b>3.01</b>	<b>24.18</b>	<b>22.20</b>	<b>4.58</b>
<b>Standard Deviation</b>	<b>3.74</b>	<b>1.85</b>	<b>5.36</b>	<b>8.16</b>	<b>2.13</b>
<b>No. of countries</b>	<b>37</b>				

# Chapter Six

## Empirical Aid-Growth Literature Review

# *Chapter Six*

## *Empirical Aid-Growth Literature Review*

### *6.1 Introduction*

After the second World War there has been a growing concern in the advanced industrial countries over the widening gap in living standards between rich and poor countries, and the assumption of an obligation on their part to help promote the economic development of the poor countries through the contribution of substantial resources to development assistance. Development aid became a major endeavour involving both financial and technical transfers. In relation to the theoretical growth models developed in the 1950s and 1960s, aid is assumed to lead to higher growth for the developing countries through a very simple mechanism. An assessment of the flow of foreign aid was performed for the very first time in the late 1960s—known as the Pearson Report [Pearson (1969)]. Surprisingly the Report acknowledged that “(E)conomic growth in many of the developing countries has proceeded at faster rates than the industrialised countries ever enjoyed at a similar stage in their own history. The fears that economically underdeveloped parts of the world were incapable of growth, or that their political problems would be so great as to produce any economic advance, have proved to be unfounded. Many of the developing countries have shown themselves capable of a major development effort” (ibid. pp.3). Yet the Report further observed that “the correlation between the amounts of aid received.....and the growth performance is very weak” (pp. 49).

Would an absence of correlation imply that aid did or does not work? Not necessarily. The reason is that foreign aid is not **the** only factor determining growth, there are a host of other factors which complement or obscure this

relationship. Attempts to deal with issue have been undertaken since the 1970s where many applied regression analysis move beyond correlation analysis.

The statistical analyses which have so far been undertaken, as discussed below, do not provide any conclusive result of the impact of aid on growth. A summary of these studies can be found in Cassen et al (1986) and Riddell (1987), but here we proceed by reproducing the models used, discussing the results, assessing their methodologies and data set along with some criticisms so that we might in the end improve our approach to evaluate the effectiveness of aid. The empirical literature is divided into two sections, section 6.2 presents single equation studies while section 6.3 analyses studies which have relied on simultaneous equation models. In earlier studies, many authors have considered foreign aid and capital inflows as synonymous, which is wrong if we are to assess the effectiveness of foreign aid as their impact may in many dimensions.

### 6.2 Single Equation studies.

Among the earlier studies, the widely cited papers by Griffin (1970) and Griffin and Enos (1970) challenged the orthodox views that foreign aid will result in increased growth, particularly that the rate of development will increase if investment rises and also that investment will rise if capital imports increase. Their main argument is that capital imports (from which they draw conclusion for foreign aid) reduce domestic savings and that "capital imports, rather than accelerating development, have in some cases retarded it" (Griffin, 1970, pp. 100). Using United Nations data for the period 1962-64 for 15 African and Asian countries, Griffin and Enos found a weak association between the amount of aid received and the rate of growth of GNP ( $Y^*$ ). The regression result was:

$$Y^* = 4.8 + 0.18 (A/Y) ; R^2 = 0.33$$

$$(?) \quad (0.26)$$

where  $Y^*$  is the growth of GNP,  $A/Y$  is the ratio of aid received as a proportion of income and the standard errors given in brackets. They also performed some further regressions which looked dubious. In fact there are many problems in their regressions. First, no diagnostic tests are reported to back the relationship in terms of heteroscedasticity for the cross-section ones and serial correlation in their time series analysis. Second, the variables used are not in real terms since they have not been deflated. Third, concerning the variables used for the dependent variable, growth rate of GDP (or GDP per capita) would be more appropriate which reflects domestic activities in a country rather than GNP growth. For the aid variable, on the other hand, the current account balance was used to deduce conclusion about foreign aid. Note that the current account balance is a mongrel of capital inflows and not necessarily foreign aid. Fourth, those regressions with only two variables yield only correlations but do not necessarily imply causation. Finally, the sample size is too small to determine any relationship, which consequently leads to biased and inefficient estimates. With all these shortcomings it would be misleading to cite these studies as evidence against foreign aid.

A similar technique was applied by Voivodas (1973, 1974). He found no relationship between foreign capital inflows and growth. He also found that foreign capital inflows are associated with a higher capital-output ratio but was not sufficient to ensure a negative relationship between capital inflows and growth as pointed out by Griffin and Enos (1970). Using time series data for Korea during the post- World War II period when foreign aid (mostly American aid) was predominant, he found a positive and significant relationship between the ratio of exports and foreign capital inflow to total product and its rate of growth (the coefficient of the aid variable was 0.92). It was further found that official foreign capital flow was contributing significantly more to investment in the period 1954-62 than 1962-1968. One plausible explanation for this observation could be that in the earlier period foreign aid was channelled towards the building of infrastructure which

crowded in private investment while in the second period foreign private investment was more significant than foreign aid.

Papanek (1973) argued that some evidence can still be deduced on the relationships between savings, foreign resource inflows, and growth in less developed countries. He pointed out in an earlier study (1972) that in many previous studies capital inflows and aid were treated synonymously where in fact one should distinguish between different types of capital inflows. In this context he disaggregated inflows into their principal components: foreign aid, foreign investment and other inflows. His model was defined as:

$$Y = \alpha + \beta S + \lambda AID + \delta FPI + \pi OFI$$

where Y is the growth rate of GDP, S is gross domestic savings, AID is foreign aid, FPI is private long-term borrowing plus net private direct investment and OFI, other capital inflows. All the independent variables are expressed as a percentage of GDP.

The above was tested for a sample of 34 countries for the 1950s and 51 countries for the 1960s which were pooled into 85 observations, he obtained:

$$Y = 1.5 + 0.20S + 0.39AID + 0.17FPI + 0.19OFI$$

$$(2.5) \quad (6.0) \quad (5.8) \quad (2.5) \quad (2.1)$$

$$R^2 = 0.37 ; F = 13.5$$

t-values in brackets. It can be found that aid has a coefficient nearly twice that of the other independent variables. This pointed out that earlier studies which combined all foreign resource flows to draw conclusions for aid were misleading and wrong.

Kraska and Taira (1974) examined the effects of capital inflow on the economic growth of the host-recipient countries in Latin America. They argued that foreign direct investment is undertaken by private firms in search for profits, while foreign aid is offered by governments of more developed countries to those of less developed ones for political reasons. But they



defended the argument that a weak relationship obtained by some earlier studies may indicate that much of foreign aid, in addition to being politically determined as to its volume and direction, goes to the formation of social overhead capital rather than into directly productive activities. Social overhead capital, they argued, is necessary for making direct production profitable and hence, one should not despair of the apparent low productivity of foreign aid. This is because when social overhead capital is being built and expanded that the activities directly related to the market can be profitably carried on. In these circumstances, the apparent lack of correlation or even an inverse correlation between foreign aid and economic growth does not mean that aid contributes nothing, or becomes an obstacle, to the economic growth of the recipient country.

Stoneman (1975) criticised earlier studies because of inadequate formulation of models, the use of biased or incomplete samples of countries, inappropriate selection of statistics, and deficiencies in the statistics themselves. Using three main samples: a 'basic' sample, an 'extended' sample, and a 'restricted' sample, he found strong positive associations between domestic savings and growth and between aid and growth (as Papanek (1973)). Although it was not possible to separate capital inflows into aid, foreign private investment and other foreign inflows, he used aggregated aid and other foreign inflows into one variable, distinguishing only direct investment. The coefficients for the aid variable were positive (ranging from 0.26 to 0.501) and were highly significant. These coefficients were slightly higher than that for savings. He concluded that aid projects were more likely to be specifically related to economic growth than investments.

Dowling and Hiemenz (1983) tested the aid-growth relationship in the Asian region using data for the 1970s. They suggested that aid flows seemed to be well utilised in many countries of the Asian region and supported Papanek's findings that a significant and positive relationship exists between aid and

economic growth in the seventies. However, growth performances were not the same for low and middle income countries. While they observed that earlier studies, except for Papanek, using cross-section data found that financial foreign aid has not led to higher rates of growth of GDP, time series analysis of a few Asian countries seems to suggest that aid contributed to growth (for example Islam (1972), Krueger (1979)).

Bearing in mind the deficiencies of the quality of data, they argued that earlier studies have many shortcomings. For instance, they have omitted many variables. Taking into account some shortcomings in previous studies, they studied the effectiveness of foreign aid in the Asian region in the 1970s based on a pooled sample of time series and cross-country data. In addition to the model fitted by Papanek (1973) and Mosley (1980), where real growth rate of GDP was regressed on foreign financial aid, private capital inflows and gross domestic savings (all as a proportion of GDP), they added four policy variables to express different aspects of government policy in each country. They were: the degree of openness of the economy (exports plus imports as a proportion of GDP), the role of governments in domestic resource mobilisation measured by central government tax revenue as a percentage of GDP, the share of public sector in economic activities measured by total government expenditure in GDP and a measure of financial repression proxied by M2 over GDP.

For the sample 13 countries were included, the data were over 4 time periods averaged (to tackle the problem of gestation lag). Their results were consistent with similar conclusions drawn by Papanek and they supported the hypothesis that the rapidly growing economies of Asia were able to utilise aid effectively. The results showed that tax effort of governments and financial liberalisation have contributed much to GDP growth. Splitting the sample into low and high growth country groups, they found that aid was more effective for the latter group than for the former. Some plausible explanations of the lack of effectiveness of foreign aid for the low growth group could be that foreign aid

may have encouraged government consumption or crowded out private investment. Also import substitution activities may have driven up the capital-output ratio thus lowering the marginal productivity of aid. Given that aid usually finances improvements in physical and social infrastructure in low growth countries, the gestation and payoff periods could be indeed very long. This, of course, cannot be determined on a cross-country basis for individual countries. For more precise conclusions in respect to individual countries time series analysis would be more helpful.

Gupta and Islam (1983) specified their model by assuming a neoclassical production function with neutral technical change. Their attempt is to explicitly estimate marginal productivities of different sources of capital formation when they are independent of the state of development and also when they depend on the behaviour of an economy at different stages of development. This can be carried out by using interaction terms. The model was specified as:

$$G = \alpha_0 + \alpha_1 (SD) + \alpha_2 (S/Y) + \alpha_3 (S/Y)(SD) + \alpha_4 (AID) + \alpha_5 (AID)(SD) + \alpha_6 (FPI) + \alpha_7 (FPI)(SD) + \alpha_8 (RFI) + \alpha_9 (RFI)(SD) + \alpha_{10}(GL) + \mu$$

where  $G$  is the growth rate of GDP,  $S/Y$  is the ratio of domestic savings to GNP,  $AID$  is the ratio of foreign aid to GNP,  $FPI$  is the ratio of foreign direct investment to GNP,  $RFI$  is the ratio of other capital inflows to GNP,  $GL$  is the growth rate of labour force and  $SD$  a proxy for the stage of development measured by per capita GNP,  $y$ .

The result was not satisfactory when the above model was estimated covering 52 developing countries over the 1950s and 1970s. Consequently a restricted version was adopted where  $G$  was regressed on  $S/Y$ ,  $AID$ ,  $FPI$ ,  $RFI$  and an interaction term to represent the stage of development was added. The interaction term was  $(S/Y)(SD)$ ,  $AID(SD)$ ,  $FPI(SD)$  and  $RFI(SD)$ , each was added to the base regression one at a time. Interesting results emerged, first, when  $(S/Y)(SD)$  was added to the base regression, its coefficient was insignificant but the coefficient of  $(S/Y)$  retained its significance. This implied

that domestic savings are an important determinant of growth irrespective of the stage of development. Second, when the interaction term for foreign aid [(AID)(SD)] was added, the AID coefficient was not significant but the interaction term was. They concluded on the basis of this result that foreign aid is useful only when it is associated with a higher stage of development. A plausible explanation would be that at a higher stage of development, the economy is better organised and managed, and aid is more effectively utilised; while at a lower stage of development, a larger portion of aid may be used for consumption purposes rather than increasing investment. Finally, each time that an interaction term is added in turn, the domestic savings rate continued to be positively significant and stable in its quantitative impact. This in a sense highlights the robustness of this variable.

Dividing their sample into three regions (Asia, Africa and Latin America), they found that foreign aid exercised a positive significant effect in Asia only and concluded that most foreign aid in this group was used for capital formation whereas in Africa and Latin America, it went largely to meet additional consumption expenditures. These findings suggest that capital is a crucial constraint in a number of Asian countries, while socio-political factors are more important for some countries in Africa and Latin America. Gupta and Islam concluded that for a proper appreciation of the role of different capital inflows, one must allow for the dependence of the effects on the state of development. And that foreign aid is the most important form of foreign capital inflows if these inflows are to accelerate growth in developing countries. They added that there are sufficient exceptions to their strong results which require caution and the need for individual country studies.

Investigating time series data for the case of Sudan for the period 1960 to 1975, El Shibly (1984) although the coefficient of the aid variable was negative but insignificant. He concluded that there seemed to be no evidence that aid has resulted in stimulating growth in Sudan but it is worth pointing out that official

foreign flows had a positive and significant effect on investment (a coefficient of 0.66). The problem of omitted variables was also found in this study, for instance, domestic savings.

Since many studies have ignored the role of the state's economic policy in the development of aid-receiving LDCs, Singh (1985) concentrated on state intervention in an economy. Using two time periods, 1960-1970 and 1970-1980, for a sample of 73 countries (36 African and 37 the rest of the Third World countries) in order to make some comparison over time, he estimated the following model:

$$Y = \beta_0 + \beta_1 AID + \beta_2 S + \beta_3 POP + \beta_4 INC + \beta_5 STIN + \beta_6 DUM1 + \beta_7 DUM2 + u$$

where Y is the average annual growth rate, AID is economic aid as a percentage of GDP, S is domestic savings rate (%), POP is total population in log, INC is per capita income in US dollar (logged), STIN is the state intervention score indicating the nation's economic policy. DUM1 is a regional dummy taking the value of 0 for the African countries and 1 for the rest, DUM2 is the oil dummy taking the value of 0 for the non-oil-exporting countries and u is the disturbance term.

He then conducted the regression analyses using two alternative specifications. First, by running the above model and second, by expanding the model including other regressors such as literacy and enrolment, and government expenditures with several specification variations. The latter specification helped in examining the sensitivity of the coefficients on the key explanatory variables. The regression analyses for the two time periods without including the state intervention variable yielded positive and significant coefficients for foreign economic aid, implying that aid did play a positive role in LDCs' growth. It has also been found that this coefficient was statistically more significant in the time period 1970-80 than the 1960-70 period. His results would suggest that aid was more effective during 1970-80. Even though the effect of aid on growth seemed much smaller, and statistically weaker than

found by Papanek (1973) and others, the results reject the negative growth-aid association found by Griffin and Enos (1970).

Government intervention, especially in Africa, is very intense and according to Singh's result, this reduces growth. Levy (1988) examined the aid-growth relationship in Sub-Saharan Africa (SSA) and provided some interesting quantitative evidence. Simple correlations between the main macroeconomic trends yielded a false linkage in the SSA sample of 22 countries. For instance, from 1968 to 1982 while GDP growth rates were falling, the investment rate and the ratio of aid to GDP were both increasing yet the simple correlation coefficients between growth and investment were positively correlated. This could indicate that the relationships are spurious.

In an attempt to analyse the relationships, two regressions were performed, one by regressing GDP growth rate on the ratio of aid to GDP and income per capita and another one where the change in GDP growth was regressed on the change of the aid ratio to GDP and income per capita. The results indicated that there is a statistically positive association among poor African countries between foreign aid (and its changes) and the level of economic growth (and its changes). Although the relationship cannot be interpreted as causal, it suggests that aid may affect growth mainly through the investment rate which was found to have positive effects. It was even found that each extra dollar of aid was associated with 1.08 additional dollars of investment for the 22 SSA countries.

The recent growth performance of the African countries has been found to deteriorate. According to Metwally and Tamaschke (1994) the deteriorating growth performance is due to the fact that their foreign debt burden keeps increasing. The debt problem is mainly attributed to two main factors. First, adverse developments in the world economy including the sharp decline in export prices, slower growth in industrial countries and in world trade, the decline in capital flows, and the slack in foreign aid. Second, inappropriate

government domestic policies which have created major distortions which resulted in severe reductions in domestic savings, productive investment and the rate of growth of the national economy.

A recent study by Hadjimichael *et al.* (1995) analysed the growth performance of Sub-Saharan African countries using a panel framework for the year 1986-92. They found that foreign aid stimulates growth initially but beyond a certain threshold level the impact on growth appears to be negative. They make use of a quadratic model in foreign aid and control for some macroeconomic factors. They have not however included other sources of capital along with foreign aid.

Mosley and Hudson (1995) have used time series data to study aid's effectiveness. Using some lag structures they found that there is not a single country studied for which aid effectiveness is consistently negative, or consistently positive. But they found that as the length of lag increases some positive impact were found.

Although single equation studies are very common, there are many who question the efficiency of the parameter estimates if aid is endogenous. If aid is endogenous then OLS estimation will lead to biased estimates. In this context some studies have used simultaneous models which we now turn to in the next section.

### **6.3 Studies using Simultaneous Equation Models.**

Gupta's (1975) model consisted of equations explaining savings rate, growth rate of income, per capita income, and total labour force participation. This model was estimated by 2SLS using cross-section data for the 1960s for 40 developing countries. For the present context, we consider only the income

growth equation and leave the savings equation for a later purpose. The estimated behavioural equation for income growth was:

$$G = 3.1193 + 0.09582 (S/Y) + 0.26582 (F) \quad ; R^2 = 0.341$$

( ? )      (1.691)      (3.735)

where  $G$  is the growth rate of GDP,  $S/Y$  is the gross domestic saving rate and  $F$ , foreign capital inflows. When foreign capital inflows was broken into its components, the following was obtained:

$$G = 3.5708 + 0.08398 (S/Y) + 0.15553 \text{ Aid} + 0.19531 \text{ FPI} + 0.29788 \text{ RFI}$$

( ? )      (1.415)      (2.671)      (1.362)      (2.097) ;  $R^2=0.296$

where  $\text{Aid}$  is net transfers received by government plus official long-term borrowing,  $\text{FPI}$  is foreign private investment including private long-term borrowing plus net direct investment and  $\text{RFI}$  is other foreign inflows. The result of the second equation contrasts Papanek's findings where the foreign aid variable was twice as other forms of capital inflows, but is still twice that of the savings rate. Analysing both equations cast some doubts especially in the absence of further statistics. The low value of the coefficients of determination would indicate omitted variables which explain growth.

Mosley (1980) also criticised earlier studies as having misspecified equations and inappropriate econometric tests. He argued that in those equations there have not been the use of any kind of lag structure relating to the independent variable (foreign inflows) and the dependent variable (growth) which is essential because of gestation lag and from donors disbursement. He also stratified the less developed countries by income levels compared to others who estimated the aid-growth relationship by continent. This would in a way enable us to deduce whether the impact of aid is greater than or less than in the lower income level group.

After taking into consideration the shortcomings of earlier studies, his estimated 2SLS model with lag structure using data for the 1970s for 83 LDCs, was:



$$\text{Growth} = 5.00 - 1.08 (\text{Aid/GNP})_{t-5} - 0.34 (\text{other financial flows/GNP})_{t-5} \\ (3.43) \quad (1.74) \quad (0.93)$$

$$+ 0.10 (\text{Savings rate}) \quad (6.1) \\ (2.43) \quad ; R^2 = 0.2885$$

His results rejected the overall positive effect of aid on growth which Papanek found for the 1960s (t-value in brackets). What Mosley obtained was a weak and insignificant but negative correlation between aid and growth. When he used the ratio of taxes to national income as an independent variable in place of savings rate (in respect to Papanek's criticism), for 47 countries for which tax ratio data were available, he obtained:

$$\text{Growth} = 6.41 - 1.08 (\text{Aid/GNP})_{t-5} - 0.14 (\text{other financial flows/GNP})_{t-5} \\ (3.35) \quad (1.63) \quad (0.30) \\ + 0.061 (\text{taxes/GNP}) \quad (6.2) \\ (6.34) \quad ; R^2 = 0.4276$$

which improves the fit further. Here also he obtained an insignificant but negative correlation between aid and GNP per capita.

Splitting the sample into 30 'poorest countries' and 53 'middle-income countries', he obtained a positive and significant relationship between aid and growth for the former group of countries (0.98) and negative but insignificant correlation for the latter group. He further found that there are many differences between donors, for instance, U.S aid is positively correlated in the middle-income countries only whilst UK aid is largely given to the poorest countries.

Mosley tried to explain variations in the aid-growth relationship. From a theoretical point of view if the recipient's marginal propensity to consume is one, then aid input will lead to no growth, since it is all consumed, whereas if the marginal propensity to save is one, then all aid goes to investment and consequently leads to growth. Given the relative 'taste' for present and future consumption (assuming both are normal 'goods'), part of the aid will go to

present consumption and the other part to investment. In practice, however, donors often influence aid allocation by tying a part or all of it to certain projects. Recipients, on the other hand, use aid funds on marginal projects, which the donors refuse to finance, or for consumption purposes (the well-known problem of the fungibility of aid). Hence, the influence of aid on growth will depend on the extent to which aid is tied to capital projects and the extent to which a recipient is able to resist such tying. From his analysis it would seem that aid is tied in low income group while in the middle income group the donors' influence is less.

Should recipients only be blamed? As Mosley indicated, the share of new development lending to total bilateral aid has fallen during the 1970s, more lending was in the form of technical assistance, food aid, debt forgiveness, which do not necessarily have any developmental component at all. Supposedly if recipients were relying on aid funds to finance certain capital projects then a reduction in aid flows will entail either stopping the projects or continue them at a higher cost. In such a case a fall in the recipients' growth is rather expected. But this contention is very different to prove since data on types of aid flows by recipient country is not always available.

Not putting the whole burden on the donors' shoulders, Mosley argued that the recipients' effort in reducing fungibility of aid into consumption expenditure is crucial. His assumption is that if a recipient government manages to increase its tax effort, then there would be very little switching of aid resources into consumption. In fact when the percentage change in tax effort is substituted for the savings rate in regression 6.1 for those countries for which data were available (using 2SLS) he obtained:

$$\begin{aligned} \text{Growth} = & -0.26 + 1.11 (\text{aid/GNP})_{t-5} + 0.23 (\text{other financial flows/GNP})_{t-5} \\ & (0.11) \quad (2.80) \quad (0.44) \\ & + 0.0027 (\text{change in tax effort } 1962-68 \text{ to } 1972-7) \quad (6.3) \\ & (3.09) \quad ; R^2 = 0.3023 \end{aligned}$$

t-values in brackets. Hence aid and growth is strongly positively related when tax effort is added. Mosley's interpretation of the results is that "increases in tax effort, where they occurred, implied a determination to build up a developmental budget from local resources without harming the recurrent budget, and that this prevented those aid-flows which were developmental in intention from soaking into recurrent budget" (pp. 88).

But Mosley's conclusion seems to be 'unfair' in the sense that he is more inclined towards finding a negative relationship between aid and growth by rejecting Papanek's findings. Yet in the beginning the negative association was insignificant and further a positive and significant relationship was found for the poorest countries. Also the relationship was significant and positive for UK-aided countries. On top of that, regression 4.3 which yielded one of the best fits, with an  $R^2$  of 0.3023 suggested a strong positive and significant relationship between aid and growth.

Mosley himself argued that his analysis is 'seriously incomplete'. This is because the model assumed that the economy is closed. In fact the coefficients of determination hardly explained 50% of the variations when GDP was the dependent variable and even less than 25% when aid was treated as the dependent variable. No causality test was carried out to support his hypothesis. Also his theory of feedback was concerned with *level* variables, while in fact he used growth rates and ratios which do not necessarily imply feedback effects. We should also add that the regressions were not supplied with enough statistics (for instance, F-test, residual sum squares, etc.). Inclusion of income per capita has not been explained with some theory underlying its presence in the regressions. In some cases the large magnitude of the constant term again indicates some problem.

Comparing regressions 6.2 and 6.3 would put the robustness of the results into doubt. Simply substituting the percentage change in tax effort for the ratio of

taxes to national income in 6.3, changed the regression results completely. The intercept value fell from 6.41 to -0.26, the aid variable which was negative and insignificant turned out to be positive and highly significant at the one percent level and the other financial flows variables changed sign from negative to positive though were still not significant. These indicate some failure in the specification and would perhaps imply that some variables are superfluous. Using fiscal behaviour model as outlined by Heller (1975), Mosley *et al.* (1987) came to similar conclusions as above. They used the OLS as compared to the 2SLS.

Rebuilding on the work of Gupta (1975), Gupta and Islam (1983) presented a structural model (similar to Gupta (1975)) with a set of behavioural relations consisting of economic as well as non-economic factors. Their model which has a system of nine equations consisted of nine endogenous variables: gross domestic saving rate ( $S/Y$ ), growth rate of GNP ( $G$ ), real GNP per capita ( $y$ ), dependency rate ( $DR$ ), birth rate ( $BR$ ), female labour force participation rate ( $FPR$ ), infant mortality rate ( $IMR$ ), total labour force participation rate ( $TLPR$ ) and percentage of labour force in agriculture ( $ALF$ ). There were eight exogenous variables: aid ( $AID$ ), foreign private investment ( $FPI$ ), other foreign inflows ( $OFI$ ), per capita energy consumption ( $EN$ ), population density ( $DEN$ ), literacy rate ( $LIT$ ), number of persons per hospital bed ( $HB$ ) and rate of growth of labour force ( $GL$ ). The model is reproduced for ready reference below:

$$(1) \quad S/Y = a_1 + b_1y + c_1G + d_1Dr + e_1AID + f_1FPI + g_1RFI + u_1$$

$$(2) \quad G = a_2 + b_2S/Y + c_2AID + d_2FPI + e_2RFI + f_2GL + u_2$$

$$(3) \quad y = a_3 + b_3EN + c_3TLPR + d_3LIT + e_3DEN + u_3$$

$$(4) \quad TLPR = a_4 + b_4DR + u_4$$

$$(5) \quad DR = a_5 + b_5BR + u_5$$

$$(6) \quad BR = a_6 + b_6LIT + c_6y + d_6ALF + e_6IMR + f_6FPR + u_6$$

$$(7) \quad FPR = a_7 + b_7ALF + c_7BR + u_7$$

$$(8) \quad IMR = a_8 + b_8LIT + c_8y + d_8ALF + e_8HB + u_8$$

$$(9) \quad ALF = a_9 + b_9y + u_9$$

From the model, only equations (1) and (2) appear to have an economic relationship, the entire model does not have any economic relationship despite the fact they explained why some variables enter into an equation (this was also criticised by White (1992)). Lacking any economic representation, the exogeneity of certain variables can be questioned, for instance, literacy rate. They did not report any exogeneity test to support their arguments.

Coming to their estimation which used data for the 1970s for a sample of 52 countries, it was rather strange to find that they use OLS on each equation in turn (which is contrary to what they mentioned in the beginning). Their argument was that applying OLS will yield estimates of the direct effects. But from elementary econometric textbooks we know that we will obtain direct effects only if the dependent variables are regressed on exogenous variables only. In their equations we find that there are endogenous variables on the RHS which in turn indicate that the estimated parameters were all biased and inconsistent. Further, the grounds on which they argued for using OLS might suggest some problem in the modelling itself. They argued that the “2SLS estimates...were invariably bad on the basis of usual statistical criteria. Therefore we report only the OLS result.” Why would the estimates be ‘bad’ if the model is correctly specified? Another plausible explanation could be because of the presence of multicollinearity or heteroscedasticity. Multicollinearity seemed to be more the case, for instance if we take their savings rate equation (Table VI.I, pp. 71), we find with an adjusted  $R^2$  of about 55%, four variables on the RHS out of six (excluding the constant term) were insignificant at the 1% level and taking their per capita income equation with an adjusted  $R^2$  of 56%, three out of four variables were insignificant at even the 5% level. The unavailability of the residual sum of squares (RSS) does not permit us to judge the validity of the model and the estimates. In some cases we observe a high value of  $R^2$  without any of the RHS variables being significant.

As pointed out above the model has no economic meaning, it makes it difficult to explain the channel through which the impact of aid can be assessed on development. Based on their results, they argued that the total labour force participation equation (Table VI.2, pp.72, Eq (5)) performed 'extremely well' because of a high adjusted  $R^2$  of around 70% while only one exogenous variable was not even significant. Omitted variables might explain this, for instance, we know from economic theory that wages (or real wages) do affect the participation rate which has completely been ignored. The results are therefore dubious, more work should be done on the modelling part bringing in more economic relationships to give satisfactory results.

Rana (1987) re-examined the relationship between foreign capital and growth in the Asian region using the sample of countries as used by Dowling and Hiemenz (1983). In this case he changed the methodology by using 2SLS. He specified a simple two-equation model consisting of a growth and a savings equation as follows:

$$GR = a_0 + a_1AID + a_2FPI + a_3S + a_4CX + a_5CLF + u_i$$

$$S = a_6 + a_7AID + a_8FPI + a_9CX + a_{10}GDPN + a_{11}GR + v_i$$

where GR is growth rate of GDP, S is gross domestic savings as a percentage of GDP, CX is the change in exports as a percentage of GDP, CLF is the change in the labour force, GDPN is GDP per capita,  $u$  and  $v$  are stochastic error terms, and the others are as before. From these, reduced form growth and saving equations were derived and estimated. Both the OLS and the indirect least squares (ILS) techniques were used for the 14 Asian countries during the period 1965-1982 using pooled cross-section and time series data.

The OLS method was applied to the structural equations so as to compare with previous studies. The ILS, on the other hand was applied to get the effect of the exogenous variables on the endogenous variable. The results using OLS confirm the findings of earlier studies that the various types of foreign capital

as well as domestic savings rate have a favourable effect on the economic growth of the Asian developing countries. The estimated coefficients of the variables were, however, lower than those of the earlier studies covering the 1950s and 1960s which suggested that the relative significance of these variables declined around the 1970s. When ILS was applied, foreign private investment and the export variable had a favourable and statistically significant effect on growth, while the effect of foreign aid was favourable in its effect but was marginally significant. Comparing the OLS and ILS results, the data indicated that the direct effects generally overestimated the favourable effect of foreign capital on the growth rate.

### **6.4 Conclusion**

The empirical literature on the effectiveness of foreign aid on growth, though vast, has shed little light on the relationship between aid and growth. In fact at the macro level, the results are mixed and inconclusive, but nonetheless, in no case was aid found to be detrimental to growth. The results differ because of differences in estimation techniques, sample size, data, model specification, etc.. Recent studies have improved upon previous ones by disaggregating capital inflows into its various components and have also tried to include some other factors, apart from the different sources of capital, which are thought to affect growth. The taxonomy described in Chapter 5 highlights the need to account for both internal and external economic conditions in assess aid's effectiveness. Although internal factors have been included in some regressions, external factors have so far been overlooked. The developing countries have, in a sense, been isolated from the happenings in the world economy. Even on the domestic front there are many important factors that have not been considered so far.

To judge the effectiveness of aid is not an easy task because in the process it is

affected by for example by government policies, institutional factors, private sector behaviour, the internal and external environment. These policies, factors and circumstances vary among countries. In the next chapter we intend to improve on past mistakes concerning sample size and composition, data quality, model specifications, omitted variables and econometric methodology.



# Chapter Seven

## Empirical Testing of the Aid-Growth Relationship

# **Chapter Seven**

## **Empirical Testing of the Aid-Growth Relationship**

### **7.1 Introduction.**

The empirical literature on the aid-growth relationship has been criticised on many grounds: sample composition, sample size, methodology, econometric technique, and variable inclusion. With regard to the latter, most studies explained growth as a function of capital accumulation when only a few, for example Dowling and Hiemenz (1983) and Mosley (1987) introduced factors such as the role played by government and trade. Dowling and Hiemenz's study showed that Asian countries have used aid effectively and suggested that other countries have not spent aid well because of bottlenecks and less efficient allocative mechanisms. But what are these allocative mechanisms and how do we identify them? It is a very important area which has so far been overlooked in the empirical literature. Only one study that of Hadjimichael *et al.* (1995) has so far included some macroeconomic factors in an aid-growth model. Developing countries share some macroeconomic characteristics. These are important issues in considering the effectiveness of foreign capital inflows which is influenced by the extent of macroeconomic instability and distortions. These are expected to vary from country to country.

In relation to the arguments set in Chapter 5, the effectiveness of aid is not only affected by the external economic conditions but also by the level of distortions and macroeconomic instability. In section 7.2 we outline some macroeconomic factors which are capable of explaining growth performance following the work of Fischer (1993) and Easterly (1993). Section 7.3 describes the variables that will be considered in the empirical regression models while in section 7.4 we specify and test the models. Because there are many studies which have conducted cross-section analysis, we present a model *à la* Fischer-Easterly in section 7.4.1. The model is tested using cross-section data for the period 1970-

93 in Section 7.4.2. Section 7.4.3 provides some conclusions and critiques on the analysis. Previous studies were unable to use time series data due to limited data availability. The time period under study enables us to build a panel framework with reasonable number of observations per country. In section 7.4.4, we explain the panel data technique to be used and we specify and test the model in section 7.4.5. Section 7.5 summarises the effectiveness of aid found when cross-section and panel data were used.

## **7.2 Macroeconomic Factors Explaining Growth.**

The World Bank has emphasised the need for a ‘supportive macroeconomic framework’ to the success of structural adjustment in every major area of the economy. According to the Bank the macroeconomic situation will be supportive when inflation is low and predictable, real interest rates are appropriate, the real exchange rate is competitive and predictable, fiscal policy is stable and sustainable and the balance of payments is perceived as viable (World Bank, 1990). The effectiveness of capital flows (and investment) will be greater when there is macroeconomic stability and few distortions. Distortionary policies, such as trade restrictions and financial repression, reduce the efficiency of capital investment and thus the rate of growth for a given level of capital investment. Removing distortionary policies does the reverse: increasing the efficiency of foreign capital (and domestic investment) and the growth rate of GDP.

The role played by macroeconomic factors and distortionary policies has been emphasised by Kormendi and Meguire (1985), Fischer (1991,1993) and Easterly (1993). Kormendi and Meguire test a set of macroeconomic hypotheses relating to economic growth such as income convergence, monetary variance, government spending, inflation and trade, Fischer (1993) goes further in arguing that “macroeconomic stability is necessary for sustainable growth is too strong, but.....that macroeconomic stability is conducive to growth” (pp.

486). Hence removing distortions will create a path for macroeconomic stability and improve growth. This view however varies according to different schools of thought. According to the standard neo-classical growth model, distortionary policies affect only the level of income and not its rate of growth. The 'new' growth models such as Romer (1986, 1989), Barro and Sala-i-Martin (1993), Jones and Manuelli (1990) and Rebelo (1991) show that distortionary policies have significant effects on long-run growth.

The problem that is encountered in practice is in measuring the extent of distortions and macroeconomic instability. Fischer (1993) uses the inflation rate as the best single indicator of macroeconomic policies and the budget surplus as the second basic indicator. The inflation rate indicates the overall ability of the government to manage the economy. Countries generating high inflation rates imply that the government has lost its control (as suggested by the experience of some Latin American countries). Tables 7.1 and 7.2 give a simple indication of the relationship over the period 1970-1993 between inflation and growth. Generally regions or countries having high inflation have experienced lower real income and per capita growth. Some exceptions, however in Table 7.2, have been noticed where poor growth performance is not associated with inflation. The extent of inflation variability over a period might also indicate the macroeconomic climate prevailing during that period.

The early literature on the impact of inflation on growth suggested a positive relationship through the Mundell-Tobin effect which involves a shift away from real money balances toward real capital as a consequence of higher anticipated inflation. Thus, more rapid rates of anticipated inflation implies more rapid shifts away from real money balances toward real capital and hence greater economic growth. This hypothesis has been reversed by Stockman (1981) where in his 'cash-in-advance' economy higher anticipated inflation reduces economic activities, hence growth. Subsequent work supports Stockman's hypothesis, for instance, Fischer (1983,1991,1993), de Gregorio

(1993), and Gylfason (1991). Possible nonlinearities in the relationship between inflation and growth has been tested by Levine and Zervos (1992) and Fischer (1993).

**Table 7.1: Regional Inflation and Economic Growth (averages).**

	1970-1980		1980-1993		
	GDP growth (%)	Inflation Rate (%)	GDP growth (%)	GNP per capita growth (%)	Inflation Rate (%)
East Asia and the Pacific	7.53	9.7	7.68	6.4	7.1
Europe and Central Europe	6.58	4.6	-0.17	-0.3	35.3
Latin America and the Caribbean	5.73	46.7	1.76	-0.1	245.0
Middle East and North Africa	4.58	16.9	0.63	-2.4	10.7
South Asia	3.38	9.7	5.15	3.0	8.6
Sub-Saharan Africa	4.14	13.8	1.47	-0.8	16.1

Source: World Bank (1995).

Concerning the fiscal variable, Fischer (1993) argues that a fiscal deficit also serves as an indicator of a government that is losing its control. Fiscal reform has been a major policy platform of the World Bank and IMF. It is argued that it is vital for both restoring a sustainable macroeconomic situation and for increasing investment and efficiency. According to World Bank (1990), reductions in fiscal deficits have typically been at the core of successful stabilisation programmes, which have often been prerequisites for successful structural adjustment. Hence reducing a fiscal deficit could result in improved growth performance, *ceteris paribus*.

Financial repression is expected to be detrimental to growth. Some developing countries overregulate their financial sector through controls on interest rates on deposits, restrictions on credit to the private sector—all of which hamper the financial sector's ability to intermediate savings efficiently (World Bank, 1989). Although financial liberalisation will usually foster growth, it will not be effective if it also creates macroeconomic instability. For example, a

reduction in forced lending to government could increase the availability of financing for private investment. But if the government needed these resources to finance its deficit and resorted instead to inflationary finance, the move could be counter productive (as in Argentina recently). Some favour repression by arguing that the promotion of high priority "productive" investment, with longer gestation periods and externalities, justifies suppressing their financial costs and so lowering their cost of capital (Gelb, 1989).

**Table 2: Selected countries inflation and economic growth (1970-93)**

	GDP growth  (%)	GNP per capita growth (%)	Inflation Rate (%)
<u>High Inflation countries with low growth<sup>1</sup></u>			
Argentina	1.36	-0.5	374.3
Bolivia	1.02	-0.7	187.1
Brazil	2.14	0.3	423.4
Ghana	2.67	0.1	37.0
Mexico	2.36	-0.5	57.9
Nigeria	-0.14	-0.1	20.6
Peru	0.45	-2.7	316.1
Sierra Leone	1.65	-1.5	61.6
Uruguay	1.34	-0.1	66.7
Zambia	1.08	-3.1	58.9
<u>Low Inflation countries with high growth</u>			
Chad	4.2	2.0	11.5
China	9.6	8.2	7.0
India	5.2	3.0	8.7
Indonesia	5.9	4.2	8.5
Mauritius	4.8	5.5	8.8
Pakistan	6.3	3.1	7.4
<u>Low Inflation countries with low growth</u>			
Cameroon	1.71	-2.2	4.0
Central African Republic	0.39	-1.6	4.2
Cote d'Ivoire	-1.05	-4.1	1.5
Niger	-0.14	-4.1	1.3
Rwanda	1.99	-1.2	3.4
The rank correlation between GDP growth and inflation = -0.2437			

<sup>1</sup> High inflation is defined here as rates above 20 percent.

### **7.3 Description of Variables**

There have not been many attempts to control for macroeconomic stability/instability and distortions in examining the aid-growth relationship. This section adds to that literature. Finding variables or proxies for policy measures is a daunting task when running regression models. The variables which we intend to use in our econometric model are:

- FAIDOECD—is Official Development Assistance (DAC) as defined by the Organisation for Economic Co-operation and Development (1993) as a percentage of the gross domestic product. We denote the square of this variable by FAIDOECD<sup>2</sup>.
- FAIDWB—is Official Development Finance as a percentage of gross domestic product—as defined by the World Bank. It includes nonconcessional and concessional official net flows. Note that technical co-operation is excluded. Its square is denoted as FAIDWB<sup>2</sup>.
- NONCON—is official nonconcessional net flows as a percentage of GDP.
- OFFFLOWS—is concessional bilateral and multilateral flows only as a percentage of the gross domestic product. Its square is denoted as OFFFLOW<sup>2</sup>.
- PRIV—is total net private flows as a percentage of the gross domestic product.
- OTHERIFS—is all other inflows which includes other net long-term capital and other net capital inflows as a percentage of the gross domestic product.
- SAV—is domestic savings as a percentage of gross domestic product.
- Openness measures—WOPEN—a weighted openness measure as defined below.

There is a vast literature highlighting the beneficial aspect of trade, trade liberalisation and trade reform in improving productivity and growth, while trade distortions result in a misallocation of resources. It is argued that trade distortions can change the pattern of social returns to alternative capital goods

and attract capital and labour into activities that are less valuable at international prices—reducing the overall productivity of capital and thus reducing growth. A more open economy with fewer distortions is expected to improve resource allocation and accelerate income growth. Openness to trade raises growth through several channels, such as access to advanced technology from abroad, possibility of catch-up, greater access to a variety of inputs for production, and access to broader markets that raise the efficiency of domestic production through increased specialisation.

Pritchett (1996) defines openness as “an economy’s trade intensity” rather than a policy measure. According to him a measure of policy openness must adjust for nonpolicy determinants of trade intensity (for example endogenous import penetration). Various measures of openness have been proposed and tested, it is still difficult to decide which is ‘the’ best measure. Edwards (1997), for instance, uses a series of openness indexes for trade policy and others to proxy trade distortions. Others use measures of openness including the ratio of total trade to GDP and changes in terms of trade.

With regard to the ratio of total trade to GDP, a positive and significant coefficient on this variable indicates that, *ceteris paribus*, an increase in trade improves growth. But where countries are exposed to overpricing on imports, for example as observed in Sub-Saharan Africa, which inflates the openness measure, can hardly be seen as being beneficial to growth. In fact, Yeats (1990) found that between 1962-1987 twenty African former French colonies paid a premium of 20-30% on average over other imports of iron and steel imports from France and similar price premia were paid by former Belgian, British, and Portuguese colonies in Africa for imports of these products from their former rulers. This distortion in trade could pick up the effect of tied aid, diseconomies of scale in distribution, market size, lack of information on competitive suppliers, and the use of overpricing to facilitate corruption. To illustrate, consider the openness measure, OPEN, defined as:



$$\text{OPEN} = \frac{(X + M)}{\text{GDP}} \quad (7.1)$$

$$= \frac{\{X + \sum_{j=1}^n Q_{mj}(p_j^w + p_j^p)\}}{\text{GDP}} \quad (7.2)$$

where  $X$  and  $M$  are total exports and total imports respectively in (7.1). With price premia imposed on imports, total imports can be expressed as the second term in the bracket of equation (7.2), where  $Q_{mj}$  is the import quantity of good  $j$ ,  $p_j^w$  is the world price of good  $j$  and  $p_j^p$  is the price premia paid by the importer on good  $j$ . Interpreted as above, an increase in  $p_j^p$  will increase the openness measure but does not necessarily imply that growth will be enhanced as resources are inefficiently used. In fact we suspect that if  $p_j^p$  is very high, then this coefficient of openness measure might turn out to be negative through distortionary import penetration. Another problem with this crude measure of openness is that countries with significant current account deficits will have a higher openness value.

In this study we use a weighted openness measure—WOPEN. The weights are current account balances of the developing countries in the sample. Out of the 58 countries on which the cross-section regressions are based, 45 countries (representing 77% of the sample size) have a trade deficit out of which 23 have a deficit greater than 5%. There is only one country which has a trade surplus greater than 5%. The weights assigned give more weight to countries closer to the equilibrium trade balance and engaged in more trade. The weight is defined

as  $\frac{|X - M|}{\text{GDP}}$ . Hence our weighted openness measure—WOPEN—is defined as:

$$\begin{aligned} \text{WOPEN} &= \frac{(X + M)}{\text{GDP}} / \frac{|X - M|}{\text{GDP}} \\ &= \frac{(X + M)}{|X - M|} \end{aligned}$$

This measure is superior to the unweighted one as we also take a country's trade intensity into consideration and trade equilibrium condition.

- The role of government has often been proxied by reference to action in mobilising domestic resources through central government tax revenue as a percentage of GDP. Also used is the share of the public sector in economic activities measured by total government expenditure in GDP (for example Dowling and Hiemenz, 1983). We define the variable EXP as total government expenditure (including all nonrepayable and non-paying payments by government, whether for current or capital purposes only) as a percentage of the gross domestic product.

Supply-side theories hypothesise that taxes necessary to support government spending distort incentives and reduce efficient resource allocation. Higher spending is alleged to reduce the efficiency of investment. On the other hand, if government spending is complementary to private investment, then government expenditure can be positively related to growth. It can increase growth if it raises the productivity of private capital—through spending on basic education, health, and infrastructure such as roads, water supply, and communications. For instance, public investment in railways and highways has been a key factor in the growth of mountainous countries such as Columbia and Mexico (Reynolds, 1985) while a lack of public infrastructure in Nigeria has hampered growth by requiring firms to invest in their own inefficient electrical generators, boreholes for water, and water treatment plants (Lee and Anas, 1989). Hence the sign on the coefficient of EXP is ambiguous.

As pointed out above, a better indicator to capture macroeconomic stability and government control (and its role) is the budget surplus—BSUR. BSUR is defined as the sum of current and capital revenue and all grants received, less the sum of current and capital expenditure and government lending minus repayments as a percentage of gross domestic product. Our preference is to use

a budget surplus variable which is more unambiguous in terms of results and captures macroeconomic stability in which we are interested.

- INF is the inflation rate calculated from World Bank data and INFSTD is the standard deviation of the inflation rate over the period 1970-1993. The latter indicator is preferred as it gives an indication of the extent of volatility in inflation over the period. As discussed above we expect that this variable will be negatively related to growth.
- Financial repression has been incorporated as a dichotomous variable by many, for example World Bank (1989) which defined financial repression as an average real interest rate below -5 percent over a period of time. Easterly (1993) has also used real interest rates below -5 percent and -2 percent. He also used the actual average real interest rate. Others have used the money supply (M2) as a percentage of GDP (Dowling and Hiemenz, 1983) as suggested by Fry (1981) denoted as MONEY in our case. Small values are associated with financial repression while large values would indicate steps closer to financial liberalism.

#### **7.4 Model Specification and Econometric Results.**

In line with previous analysis we estimate our model in a cross section setting. There are however limitations associated with this methodology therefore we also estimate the model in a panel setting.

7.4.1 Cross Section Analysis.

The model which we estimate is of the following form:

$$Y_i = \alpha_i + \beta'X_i + \lambda'Z_i + u_i \quad \text{where } i = 1, 2, \dots, 58.$$

where  $Y_i$  is the average growth rate of GDP over the period 1970-93 for country  $i$ ,  $X_i$  is a column vector of different sources of capital (domestic and foreign),  $Z_i$  is a column vector including trade, financial repression, macroeconomic variables and other variables which are now commonly incorporated in new growth models of a Barro-type fashion, and  $u_i$  is the error term. The model is assumed to satisfy the classical linear regression model assumptions.

So far in the literature all empirical investigations using regression analysis have tested the aid-growth relationship using a linear approach (except Hadjimichael *et al.* (1995) for panel data). We depart slightly from this and test with the inclusion of a quadratic form. The reason for this model is as follows. The two-gap model framework indicates that foreign aid is used to fill either the savings or the foreign exchange gap whichever is greater; this in turn leads to the targeted growth of output. But some caveats need to be outlined. First, we should be asking whether the 'right' amount of foreign aid is being disbursed to the recipient. If the recipient receives an amount less than prescribed by the gap model to achieve the targeted growth rate, then insufficient finance for some large scale projects could result in resources being inefficiently used and diverted to unproductive projects. In essence these funds will be regarded as being fungible. On the other hand, over-borrowing and/or over-lending can also cause some serious problems, for example, Dutch Disease (see for instance van Wijnbergen (1984, 1986) and Younger (1992)). Over-lending<sup>2</sup> can hence also lead to a waste of resources. Thus in both cases, inadequate or excessive inflows of foreign aid can be associated with fungibility. Second, we should also ask whether the recipient can make

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<sup>2</sup> There are other problems from over lending see Woodward (1992).

effective and efficient use of the foreign aid inflow. This in turn depends on what Chenery and Strout (1966) referred to as the “limit on the ability to invest”. This reflects the view that absorptive capacity for additional investment is limited by the supply of complementary inputs which can only be increased as a result of the development process. These complementary inputs are, for instance, managerial expertise, skilled labour, civil servants (skill limit) and so on. Hence a country which faces these deficiencies will not be able to utilise foreign aid resources efficiently and consequently fungibility is the final outcome.

The recent experience of the debt problems is generally regarded as a sign that countries either over-borrowed or that creditors over-lent in the 1970s. From these we can use the quadratic form to see the consequence on growth when there is too much foreign aid, and include the square of the foreign aid ratio. This tells us whether beyond a certain threshold foreign aid is fungible or not. The model to be estimated is hence as follows:

$$\begin{aligned} \text{Growth} = & \alpha_0 + \beta_{1i} \text{FAIDOECD} + \beta_{2i} \text{FAIDOECDSQ} + \beta_{3i} \text{PRIV} + \beta_{4i} \text{SAV} + \\ & \beta_{5i} \text{OTHERIFS} + \beta_{6i} \text{WOPEN} + \beta_{7i} \text{MONEY} + \beta_{8i} \text{BSUR} + \beta_{9i} \\ & \text{INFSTD} + \beta_{10i} \text{DUM3} + \beta_{11i} \text{DUM6} + \epsilon_i \end{aligned}$$

From the 68 countries listed in Appendix 5.1, 10 have been excluded due to non-availability of data or when the country has less than 10 observations for the fiscal variable over the period 1970-93<sup>3</sup>. In the sample there are 19 Latin American and Caribbean countries and 22 Sub-Saharan African countries. Because these share some distinctive features we use a dummy variable for each region, DUM3 and DUM6 respectively. The data source is the World Bank STARS CD-ROM, Government Finance Statistics and the International Financial Statistics. All the variables in the model have been averaged over the period 1970-93.

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<sup>3</sup> These are Algeria, Benin, Central African Republic, Congo, Cote d'Ivoire, Egypt, Mali, Niger, Oman and Senegal.

It should again be emphasised that the motivation for this model is to control for the policies and factors discussed above. Previous studies have been more concerned about correlations between growth and different sources of capital rather than aid effectiveness when not controlling for the Z variables. It is easy to see that foreign aid would be more effective in countries where the macroeconomic framework is stable than unstable. By controlling for such stability/instability we get closer to the potential effectiveness of foreign aid and other capital sources.

### **7.4.2 Cross Section Results.**

Table 7.3 in Appendix 7.1 presents the correlation matrix of the variables used in the regressions. This helps in indicating any potential collinearity among the explanatory variables. The cross-section results<sup>4</sup> for the 58 countries are given in Tables 7.4, 7.5 and 7.6 when the dependent variable is average GDP growth rates for the period 1970-93. Column 1 (Table 7.4) is the usual estimated aid-growth model with regional dummies but without any Z variables. Although the coefficient of FAIDOECD is positive it is not significant. This specification explains only around 27% of the variation (the adjusted  $R^2$ ) in growth. Note that the residuals are not normally distributed which invalidates the usual F and t tests. Column 2 reports on a Fischer-Easterly type regression with the non-linear form and including the Z variables: the weighted openness measure (WOPEN), the proxy for financial repression (MONEY), the budget surplus (BSUR) and the deviation of the inflation rate—measuring the volatility (INFSTD). This improves the model fit significantly<sup>5</sup>. In fact this non linear model explains around 58% of the variation in growth (adjusted  $R^2$ ).

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<sup>4</sup> The regression outputs are not reported in the thesis but are available from the author upon request.

<sup>5</sup> An F-test to assess the incremental contribution of these variables suggest an improvement in the model, the computed F-value being 7.89 with degrees of freedom 5 and 46. See Gujarati (1995) for such a test.

**Table 7.4: Cross-Section Regressions (OLS).****Dependent Variable: Average GDP Growth 1970-1993 (N = 58).**

Independent Variables	Column 1	Column 2	Column 3	Column 4
Constant	3.314 (0.000)***	2.5891 (0.009)***	3.1593 (0.000)***	3.1437 (0.000)***
FAIDOECD	0.0335 (0.428)	0.19869 (0.074)*	0.087723 (0.016)**	0.099806 (0.009)***
FAIDOECD SQ	-	-0.004168 (0.286)	-	-
PRIV	-0.0811 (0.534)	-0.24668 (0.061)*	-0.21409 (0.093)*	-0.13265 (0.203)
SAV	0.1125 (0.006)***	0.11369 (0.000)***	0.1020 (0.000)***	0.13875 (0.000)***
OTHERIFS	0.0102 (0.572)	0.025031 (0.093)*	0.025705 (0.085)*	0.01856 (0.309)
WOPEN	-	0.010497 (0.009)***	0.010568 (0.009)***	0.011979 (0.077)*
MONEY	-	0.036089 (0.027)**	0.032717 (0.041)**	0.023938 (0.097)*
BSUR	-	0.30719 (0.000)***	0.29859 (0.000)***	-
EXP	-	-	-	-0.07286 (0.023)**
INFSTD	-	-0.000773 (0.180)	-0.000989 (0.070)*	-0.001427 (0.003)***
DUM3	-1.98 (0.000)***	-1.6252 (0.005)***	-1.7777 (0.002)***	-1.7168 (0.004)***
DUM6	-1.55 (0.007)***	-1.5911 (0.006)***	-1.4942 (0.009)***	-1.4904 (0.001)***
R <sup>2</sup>	0.35060	0.65981	0.65122	0.51452
Adj.R <sup>2</sup>	0.2742	0.57846	0.57702	0.41123
F	4.59**	8.11***	8.78***	4.98***
RSS	159.55	83.58	85.69	119.28
Breusch-Pagan $\chi^2$	19.645	7.38	7.64	33.51***
Jarque-Bera statistic <sup>6</sup>	20.11***	1.64	0.97	15.17***

Note: p-values in parentheses. Based on the Breusch-Pagan  $\chi^2$  test if at the 10% level of significance heteroskedasticity was detected, then the p-values reported are those following Mackinnon-White (1985) heteroskedasticity test. For the other equations the usual p-values apply. Variables as defined in text.

\*\*\*, \*\* and \* imply significant at least 1%, 5% and 10% level respectively.

<sup>6</sup> The Jarque-Bera normality test is based on the OLS residuals, it asymptotically follows the chi-square distribution with 2 degrees of freedom, the null hypothesis is that the residuals are normally distributed.

The coefficient of FAIDOECD in Column 2 becomes significantly positive when controlling for the Z variables and has a lower coefficient (around 0.20) to that reported by Papanek (1973) on the aid variable (0.39). If we look at the significance on total net private flows, PRIV, it is negative and significant at the 10% level. This can be explained by the flow itself where a sharp increase was observed during the oil crisis and subsequent downfall in the debt crisis period. A cross-section model using averages over the entire sample period may not pick up these effects. This would support further investigation by breaking down the sample period into the phases described earlier (and/or using panel data).

Coming to the basic macroeconomic indicators, in Column 2, only the budget surplus variable is significant and consistent with Fischer's (1993) findings in terms of sign, magnitude and significance where the budget surplus coefficient was 0.277. Instead of the inflation rate used by Fischer we have used its standard deviation, INFSTD, as a measure of volatility. The inflation rate and its deviation are highly correlated, 0.95 (see table 7.3 in the Appendix) supporting the inclusion of one but not both as used by Hadjimichael *et al.* (1995). Although the coefficient of INFSTD is negative it is not significant. But as will be discussed below when we experiment with different measures of openness (see Appendix tables 7.4A and 7.4B), this inflation variable becomes significant supporting the hypothesis that macroeconomic stability is conducive to growth. The quadratic term in column 2 (FAIDOECD<sup>2</sup>) has a negative (but insignificant) sign, which suggests that "too much" foreign aid does not hurt developing countries. For the sake of comparison with earlier studies, the model was run without the quadratic term (column 3). Notice that the coefficient of foreign aid fell to 0.0877 while its significance increased. Even though earlier studies used a linear specification, a positive and significant contribution of foreign aid on growth is rarely reported. One of the reasons could undoubtedly be because of omitted variables such as trade, macroeconomic indicators and so on in those studies.



The budget surplus and inflation variables are significant in column 3. These suggest, *ceteris paribus*, that fiscal deficits are associated with a deterioration in growth performance and that efforts to reduce inflation volatility is conducive to growth. In checking whether government expenditure supports the supply-side hypothesis we replaced budget surplus by total government expenditure as a proportion of GDP—EXP, in column 4. The result seems to substantiate the supply-side view with the coefficient being negative and significant. This supports the view that greater government intervention adversely affects efficiency, productivity and growth.

The financial repression variable proxied by M2 over GDP—MONEY—suggests that repressing the returns on financial assets either through inflationary confiscation of real money holdings or through holding interest rates at below-market-clearing levels have negative effects on growth. The coefficient of MONEY is significantly positive in all the regressions (linear and non linear as well in Tables 7.4, 7.5 and 7.6). This in turn would advocate financial liberalisation beneficial effects on growth.

With respect to the openness measure—WOPEN—this is positive and significantly related to growth in all the regressions in Tables 4, 5 and 6<sup>7</sup>. We found a somewhat expected negative coefficient due to the high import price premia paid by African importers and the magnitude of their current account deficit. By adopting our weighted openness measure—WOPEN, a positive and

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<sup>7</sup> A range of other openness measures were used: collected trade taxes (TTAX) defined as the ratio of total revenues on international trade (exports plus imports) to total trade, the black market exchange rate premium (LNBMP), the average of export and import as a proportion of GDP (OPEN1), the openness measure as defined in the Penn World Table Mark 5.5 (OPEN2), the growth rate of total trade as a percentage of GDP (TGG) and changes in the terms of trade (ZTOT1). While the foreign aid coefficient did not change much in terms of magnitude and significance when using these different measures (except when we used the crude openness measure OPEN1), none of them were significantly different from zero. In fact these openness measures were not even found to be highly correlated with each other. Since in our sample there are 22 Sub-Saharan African countries, the result substantiates Yeats' findings that over-priced import or aid-tied trade hampers growth as indicated by the crude openness measures.

**Table 7.5: Cross-Section Regressions (OLS).****Dependent Variable: Average GDP Growth 1970-1993 (N = 58).**

Independent Variables	Column 1	Column 2	Column 3	Column 4
Constant	3.6454 (0.000)***	2.430 (0.013)**	2.5565 (0.010)***	2.5274 (0.009)***
AIDPOP	0.01555 (0.046)**	-	-	-
FAIDWB	-	0.26413 (0.026)**	-	-
FAIDWBSQ	-	-0.006768 (0.111)	-	-
NONCON	-	-	0.33971 (0.496)	-
NONCONSQ	-	-	-0.010749 (0.839)	-
OFFFLOWS	-	-	0.58893 (0.058)*	0.58138 (0.021)**
OFFFLOWSSQ	-	-	-0.040485 (0.195)	-0.032691 (0.083)*
PRIV	-0.2128 (0.106)	-0.24939 (0.055)*	-0.14179 (0.252)	-0.13094 (0.282)
SAV	0.075215 (0.005)***	0.11402 (0.000)***	0.09592 (0.002)***	0.09879 (0.001)***
OTHERIFS	0.027962 (0.068)*	0.027092 (0.068)*	0.025196 (0.097)*	0.25071 (0.092)*
WOPEN	0.010969 (0.008)***	0.01050 (0.009)***	0.009802 (0.017)**	0.010236 (0.012)**
MONEY	0.032576 (0.046)**	0.03695 (0.024)**	0.036156 (0.032)**	0.037815 (0.022)**
BSUR	0.29377 (0.000)***	0.31936 (0.000)***	0.32544 (0.000)***	0.32713 (0.000)***
INFSTD	-0.000484 (0.345)	-0.000418 (0.549)	-0.000473 (0.537)	-0.000392 (0.586)
DUM3	-1.9195 (0.001)***	-1.6762 (0.003)***	-1.7755 (0.005)***	-1.6509 (0.004)***
DUM6	-1.2466 (0.024)**	-1.5349 (0.007)***	-1.4550 (0.011)**	-1.4392 (0.009)***
R <sup>2</sup>	0.63729	0.66401	0.66726	0.65980
Adj. R <sup>2</sup>	0.56011	0.58366	0.56895	0.57845
F	8.26***	8.26***	6.79***	8.11***
RSS	89.11	82.55	81.75	83.58
Breusch-Pagan $\chi^2$	3.27	6.52	6.22	6.10
Jarque-Bera statistic	0.99	0.05	1.79	2.44

Note: Details as in Table 7.4.

significant value is observed. This would imply, *ceteris paribus*, that countries which are engaged in higher trade and having a trade balance have more growth potential than a closed economy.

In running these regression models the foreign aid variable has been defined as foreign aid as a ratio of GDP. Some authors have expressed concerns at using such a variable (for example, Lipton (1986)). They pointed out the risk of running into a 'trap' when expressing foreign aid as a ratio of GDP that, except in the very long run, the ratio of aid to GDP is 'automatically' boosted by a big aid rise, or by a period of sluggish or negative GDP growth. In this context, we test whether the aid-growth relationship still holds when using aid per capita (AIDPOP) instead of FAIDOECD in column 1 of Table 7.5. The positive aid-growth relationship still holds. Note that the results are robust.

So far the foreign aid component is Official Development Assistance as defined by the OECD, i.e. official concessional loans which have a grant element of at least 25%. The World Bank on the other hand tries to see the impact of official flows on developing countries, defined as Official Development Finance (ODF). This comprises concessional and nonconcessional official net flows and grants (technical co-operation is excluded). We define ODF as a ratio of GDP as FAIDWB and its square as FAIDWBSQ. We then replace the foreign aid variables by FAIDWB and FAIDWBSQ in our non linear model to see its impact on growth. This is reported in column 2. It can be observed that FAIDWB has a higher positive and significant coefficient than FAIDOECD in Table 7.4. Because of this difference we separate concessional and nonconcessional official net flows as a proportion of GDP (OFFLOWS and NONCON respectively) and see their individual impact as in column 3. *Ceteris paribus*, nonconcessional official flows do not have any impact on growth, while on the other hand concessional official net flows seems to have a much higher impact individually. At this stage we can only speculate that nonconcessional official net flows do not have

any major effect on growth because they are primarily motivated by commercial and political motives. Running another regression without the nonconcessional flows variables in column 4, we can compare the foreign aid variables FAIDWB (in column 2) with OFFFLOWS in column 4. We find that with the latter the impact is higher on growth when we exclude grants and technical co-operation from ODA. This finding is consistent with those of Gang and Khan (1991) and Khan and Hoshino (1992) that official loans are used productively while grants are fungible, the latter being used as tax relief. However, the square of OFFFLOWS is negatively significant. This suggests that beyond a certain level, concessional official net flows can have some harmful effects on developing countries (for instance, contracting 'Dutch Disease' as suggested by van Wijnbergen (1984) where there is a tendency for the real exchange rate to appreciate).

In Table 7.6 we report the results of introducing dummy variables for regional differences. These support earlier findings and are significant in all regressions. To test the hypothesis of income convergence among the developing countries in the sample we run an augmented Barro-type model which includes initial income—GNP70, initial primary and secondary school enrolment rates—SEC70 and PRIM70 respectively, a social indicator—the fertility rate in 1993—FERTI93, the different sources of capital together with the Fischer-Easterly variables. The results do not support income convergence. This may suggest that convergence only applies to a sub-sample. Among the human capital measures, the primary school enrolment rate is insignificant while the secondary school enrolment rate is significantly different from zero at the 5% level. The latter might be picking up some of the "initial" effect not captured by initial income. The foreign aid impact on growth is still positively significant in all three cases. Again it can be seen that the effectiveness of concessional flows (OFFFLOWS) is higher than Official Development Finance (FAIDWB) which in turn is higher than Official Development Assistance

**Table 7.6: Cross-Section Augmented Barro Regressions (OLS, N= 58).**

Independent Variables	Column 1	Column 2		Column 3
Constant	5.6461 (0.004)***	5.3082 (0.005)***		5.5875 (0.002)***
FAIDOECD	0.25630 (0.029)**	-	OFFLOWS	0.71376 (0.004)***-
FAIDOECD SQ	-0.006816 (0.107)	-	OFFLOWSSQ	-0.043299 (0.018)**-
FAIDWB	-	0.29834 (0.011)**		-
FAIDWBSQ	-	-0.008543 (0.043)**		-
PRIV	-0.23687 (0.066)*	-0.24014 (0.060)*		-0.11221 (0.351)
SAV	0.10311 (0.003)***	0.10401 (0.002)***		0.08897 (0.004)***
OTHERIFS	0.020791 (0.151)	0.023576 (0.099)*		0.021357 (0.126)
WOPEN	0.009786 (0.013)**	0.009938 (0.011)**		0.0094938 (0.013)**
MONEY	0.04158 (0.018)**	0.04387 (0.013)**		0.045646 (0.009)***
BSUR	0.27722 (0.000)***	0.29112 (0.000)***		0.30154 (0.000)***
INFSTD	-0.000368 (0.524)	0.000469 (0.953)		0.0000634 (0.927)
GNP70	$0.461 \times 10^{-11}$ (0.725)	$0.478 \times 10^{-11}$ (0.719)		$0.594 \times 10^{-11}$ (0.644)
PRIM70	-0.00264 (0.838)	-0.002404 (0.842)		-0.001638 (0.888)
SEC70	-0.056003 (0.020)**	-0.05693 (0.017)**		-0.063511 (0.007)***
FERTI93	-0.48213 (0.065)*	-0.43319 (0.078)*		-0.49225 (0.044)**
DUM3	-1.4359 (0.016)**	-1.5037 (0.009)***		-1.4304 (0.011)**
DUM6	-1.6371 (0.009)***	-1.6705 (0.007)***		-1.6048 (0.008)***
R <sup>2</sup>	0.72013	0.72600		0.73605
Adj.R <sup>2</sup>	0.62017	0.62814		0.64179
F	7.20***	7.42***		7.81***
RSS	68.76	67.32		64.88
Breusch-Pagan $\chi^2$	9.91	7.92		8.60
Jarque-Bera statistic	0.60	0.99		1.47

Note: Details as in Table 7.4.

(FAIDOECD). Notice that their squares are also significant, except in column 1 where it is marginal significant at the 10% level.

Overall, these results suggest that foreign assistance impacts positively on growth. The obvious question is why have so many previous studies failed to find a positive and significant impact for foreign aid? The answers may include sample composition and size, omitted variables, gestation lags and the fact that the effectiveness of foreign assistance has started to pay-off in recent years. We should bear in mind that developing countries were involved in the economic turmoil of the 1970s and 1980s which could have dissipated the potential positive effects of foreign assistance. The reason we believe that the gestation lags of foreign aid is becoming more effective in recent years is also confirmed by Hajimichael *et al.* (1995).

As we have suggested, averaging the data over the period 1970-93 could be one of the reasons why the private flows variable is not positively related to growth. To tackle this problem we split the sample period into three phases: Phase I—the oil price shocks (1974-81), Phase II—the international debt crisis (1982-87) and Phase III—trade liberalisation (1988-93). In running the regressions for these phases, we have preferred to present the results using the simple linear model specification because, first, when we tried the non linear model neither FAIDOECD nor FAIDOECD<sup>2</sup> were significant for any phase. Second, we can use these results to compare with earlier studies and third, since our variable of interest is the impact of net private flows, the non linear model does not affect our conclusion. Table 7.7 presents the results for these different phases.

When we compare the three phases, we find that during the oil price crisis, column 1, the massive inflows of private funds (most of which were at commercial lending rates) from oil producers had a positive and significant effect on growth of developing countries. A possible reason which could

explain this is the fact that recipients were using these funds efficiently in sectors with high rates of return. The foreign aid variable, as measured by FAIDOECD, did not have a significant effect on growth during this “shock” period. The domestic savings coefficient although being positive and significant has a lower coefficient than the coefficient for the 1970-1993 period. During this period countries with macroeconomic stability seemed to have more growth potential, thus growth is enhanced in an environment where the budget deficit is relatively low and where inflation is less volatile. Also note that high oil prices are reflected in the inflation variable which captures macroeconomic uncertainty. Its coefficient is higher than in any other regressions. With regard to regional growth differences, it seems that countries in Sub-Saharan Africa were more affected than other developing countries.

With the onset of the debt crisis, the financing of those contracted commercial private loans became very costly. In column 2 the capital flows variables were not significant. These support the view that developing countries were diverting resources to finance their debts and rising interest rate payments rather than investing in productive sectors. Although the level of foreign aid was constantly flowing in during this period, it is still insignificantly different from zero. Again statistics show that most of these funds were in the form of debt relief. Countries in the Latin American region had lower growth than other developing countries which is not surprising given their debt problems.

With the ending of the debt crisis and the recent emphasis on trade reform, economic growth in developing countries has started to resume. Phase III, has generated new evidence on the effectiveness of foreign assistance. In columns 3 and 4 the foreign aid variable turns out to be positive and significant. With the end of the debt crisis, domestic resources were put to more productive use as observed by the domestic savings coefficient which is significantly different from zero. But contrary to our expectations, the openness measure is not significantly positive in any of these phases. When we compare regressions

covering the whole period 1970-93 with the results in column 3, they might suggest that gains from trade is a long-run rather short-run phenomenon. Our macroeconomic uncertainty variable, the standard deviation of the inflation rate, performs rather well as expected.

**Table 7.7: Cross-section Regressions for Different Phases (OLS).**  
(Dependent Variable: Average GDP Growth).

Independent Variables	Column 1 (Phase I) 1974-81	Column 2 (Phase II) 1982-87	Column 3 (Phase III) 1988-93	Column 4 (Phase III) 1988-93
Constant	3.9616 (0.010)***	4.5398 (0.003)***	2.9929 (0.031)**	3.0527 (0.031)**
FAIDOECD	0.16749 (0.247)	0.022718 (0.735)	0.08678 (0.025)**	0.08088 (0.028)**
PRIV	0.35006 (0.002)***	0.00148 (0.992)	0.36864 (0.014)**	-
PRIVLO	-	-	-	0.21306 (0.458)
FDI	-	-	-	0.46443 (0.014)**
SAV	0.072525 (0.060)*	0.02565 (0.578)	0.11754 (0.035)**	0.11578 (0.040)**
OTHERIFS	-0.0000707 (0.994)	0.03081 (0.589)	0.2230 (0.067)*	0.24547 (0.062)*
WOPEN	-0.01117 (0.237)	0.00714 (0.145)	-0.00645 (0.829)	-0.00794 (0.793)
MONEY	0.007956 (0.752)	-0.005146 (0.812)	-0.15366 (0.316)	-0.015198 (0.337)
BSUR	0.17080 (0.035)**	0.051447 (0.412)	0.04575 (0.441)	0.0495 (0.414)
INFSTD	-0.017945 (0.016)**	-0.000747 (0.240)	-0.002701 (0.000)***	-0.002614 (0.000)***
DUM3	-2.0331 (0.009)***	-3.4079 (0.001)***	-1.7862 (0.015)**	-1.8512 (0.016)**
DUM6	-2.4171 (0.023)**	-2.5447 (0.022)**	-2.5256 (0.009)***	-2.5224 (0.008)***
R <sup>2</sup>	0.35755	0.33335	0.61911	0.62312
Adj.R <sup>2</sup>	0.22906	0.19730	0.52843	0.52201
F	2.78***	2.45**	6.83***	6.16***
RSS	303.47	311.24	169.67	167.89
Breusch-Pagan $\chi^2$	21.12**	15.00	33.71***	30.68***
Jarque-Bera statistic	0.33	0.33	1.08	0.88
N	61	60	53	53

Note: Details as in Table 7.4.



Due to the recent upsurge in foreign direct investment, we have decomposed total net private flows into net private loans and foreign direct investment both as a proportion of GDP (PRIVLO and FDI respectively) in column 4. Immediately one can observe the high impact of FDI flows while the private loans coefficient is insignificantly different from zero. Another less significant but interesting result is that developing countries have even started to make greater use of other foreign inflows, the variable *OTHERIFS* being positive and significant.

Given that the 1970-93 period can be regarded as being a ‘long-run’ relationship, the next question to ask is whether a country needs to have some economic pre-conditions for the impact of foreign aid to be effective. To do so we divide our sample, first, into ‘low’ growth and ‘high’ growth countries (the term ‘low’ and ‘high’ are as defined as countries being below and above the median value respectively). It is therefore possible to compare what the World Bank often refers as ‘under-’ and ‘over-’ achievers respectively. Second, we compare whether the level of foreign aid matters by distinguishing between ‘low’ and ‘high’ foreign aid receivers, and third, we investigate between income level, i.e., low-income group versus middle income group.

When running the non linear model for low and high growth countries, the foreign aid and its square were not significant in case which motivates us to use the linear model. The results are presented in Table 7.8 below. We can find that the effectiveness of foreign aid is higher for high growth countries than it is for low growth countries. The former is in fact almost two and half times higher in magnitude (0.17456 compared to 0.072396). Notice that the domestic savings and other inflows coefficients are significant for the over-achievers while they are not for low growth countries which include mainly Sub-Saharan African countries. With regard to the openness measure, not surprisingly it is significant only for the high growth country group which includes countries

such as Indonesia, the Republic of Korea, Malaysia and Thailand. This would tend to imply that trading opportunities have been more beneficial to high growers. Regarding the macroeconomic variables, because the budget surplus was correlated with other variables we have used instead government expenditure in both equations so that it makes comparison easier. For the low growers government intervention seems to distort incentives and reduce efficient resource allocation while it is insignificantly different from zero for high growers. Macroeconomic uncertainty has also been of much more concern for low growers than for high growers. For both country groups financial liberalisation promotes economic growth as the coefficient on MONEY is positive and significantly different from zero.

**Table 7. 8: Cross-Section Regressions (OLS) for Low and High Growth Country Groups. (Dependent Variable: Average GDP Growth).**

Independent Variables	Column 1 Low Growth Countries	Column 2 High Growth Countries
Constant	2.3220 (0.000)***	0.79924 (0.311)
FAIDOECD	0.072396 (0.018)**	0.17456 (0.017)**
PRIV	0.10451 (0.315)	-0.33756 (0.116)
SAV	0.04624 (0.156)	0.16272 (0.002)***
OTHERIFS	0.008633 (0.362)	0.087025 (0.095)*
WOPEN	0.00505 (0.289)	0.012844 (0.019)**
MONEY	0.049936 (0.005)***	0.039717 (0.034)**
EXP	-0.11912 (0.000)***	-0.008585 (0.264)
INFSTD	-0.0011388 (0.009)***	-0.00935 (0.663)
R <sup>2</sup>	0.55090	0.55083
Adj.R <sup>2</sup>	0.36181	0.37972
F	2.91**	3.22***
RSS	12.63	41.33
Breusch-Pagan $\chi^2$	4.80	9.85
N	28	30

Note: Details as in Table 7.4.

The level of foreign aid flowing in and the level of economic development might shed further light on the effectiveness of foreign aid. Table 7.9 reports results for different country groups. Low foreign aid receivers seem to rely more on their domestic resources to promote growth than on foreign resources (column 1). On the other hand, for high foreign aid receivers none of the different sources of capital is significant. In fact column 2 reports the poorest fit of all regressions (an adjusted  $R^2$  of 0.012).

When we split the sample into low income and middle income groups, we obtain unsurprising results. Foreign aid is more productive in middle income countries than in low income countries. This is not too surprising as in low income countries most of foreign aid funds are directed to poverty alleviation, debt relief, infrastructure, etc., while in middle income countries they gain from an already established infrastructure so that these flows are more productive. The private flows variable is negative and significant only in the low income group. Again we stress that this might be the result of its trend and also possibly also due to the effect of accumulated private loans contracted during the oil price crisis to which repayments have to be made. Domestic savings is significant for both groups. Note also that middle income countries being more open to trade and having a lower current account deficit, the openness measure has a positive and significant effect on growth. Because there was a correlation between MONEY and SAV, and MONEY and INFSTD, we used FINREP5—a dummy variable to represent financial repression instead of MONEY—it takes a value of 1 for real interest rates below -5%, 0 otherwise. For the low income countries it can be observed that financial repression is a deterrent to growth while it is insignificant for middle income countries. Hence, splitting the sample into low-income and middle-income countries suggests that foreign aid is more effective in countries which are above a certain level of economic development.

**Table 7.9: Cross-Section Regressions (OLS) for different country groupings****Dependent Variable: Average GDP Growth.**

<b>Independent Variables</b>	<b>Column 1 Low Aid Receivers</b>	<b>Column 2 High Aid Receivers</b>	<b>Column 3 Low Income Countries</b>	<b>Column 4 Middle Income Countries</b>
Constant	1.9093 (0.235)	0.08553 (0.960)	3.443 (0.019)**	1.9529 (0.171)
FAIDOECD	0.70193 (0.526)	0.34178 (0.164)	0.05174 (0.778)	0.33896 (0.086)*
FAIDOECD SQ	-0.1066 (0.715)	-0.01059 (0.191)	-0.003536 (0.590)	-0.00604 (0.410)
PRIV	-0.19959 (0.387)	-0.16175 (0.188)	-0.8614 (0.030)**	-0.27963 (0.178)
SAV	0.12816 (0.013)**	0.07682 (0.304)	0.14860 (0.023)**	0.13973 (0.016)**
OTHERIFS	0.06246 (0.162)	-0.008815 (0.106)	-0.001484 (0.928)	0.12294 (0.053)*
WOPEN	0.007374 (0.193)	0.01726 (0.494)	-0.017366 (0.187)	0.015167 (0.018)**
MONEY	0.051985 (0.026)**	0.0095496 (0.837)	-	-
FINREP5	-	-	-1.0421 (0.096)*	-0.984 (0.216)
EXP	-0.10272 (0.073)*	0.0051 (0.139)	0.008992 (0.201)	-0.01974 (0.638)
INFSTD	-0.001482 (0.121)	0.000013 (0.984)	-0.003047 (0.084)*	-0.001942 (0.095)*
R <sup>2</sup>	0.56077	0.35384	0.67730	0.50749
Adj. R <sup>2</sup>	0.37252	0.01176	0.48369	0.31473
F	2.98**	1.03	3.50**	2.63**
RSS	52.51	72.92	7.56	75.75
Breusch-Pagan $\chi^2$	8.40	49.61***	25	3.50
N	31	27	25	33

Note: Details as in Table 7.4.

### **7.4.3 Conclusion on Cross Section Estimation.**

The investigation carried out using cross-section data has been very informative and points to a positive and significant aid-growth relationship. There are multiple reasons why many previous studies were unable to find a positive and significant impact of foreign aid on growth at a macro level. The first concerns sample composition —many studies seem not to have scrutinised their sample properly, for instance, in many cases we find the inclusion of small countries and many outliers. In this study we excluded small countries (those having a population less than one million in 1993) and countries receiving foreign aid in excess of 40% of their GDP. The results reported in Tables 7.8 and 7.9 would suggest another important issue in sample selection. If a sample has, for instance a lot of low-income countries then we are bound to conclude that foreign aid is ineffective for developing countries. Looking at the last row in these tables we can find that our sample has a representative mixture of low and middle income countries.

The second reason pertains to the sample period. In fact studies which have used data before the trade liberalisation period (as we defined it), have mostly found evidence of an insignificant impact of foreign aid on growth, while recent studies would support its effectiveness, for example Hadjimichael *et al.* (1995) and our result. Our reason for believing this is that when we split the sample period into different phases we fail to find any significant impact of foreign aid in the pre-trade liberalisation phase. Even though we tried to pool the first and second phases we were unable to find any significant impact. This supports the findings of previous studies using such sample periods. When we investigated the third phase, 1987-93, then a positive and significant effect of foreign aid emerged. All these suggest either that the beneficial effects of foreign aid were/are dampened when there is a negative external shock making it impotent or that foreign aid investments in the 1970s and 1980s have started

to payoff. Another possibility is that trade liberalisation and macroeconomic stability are necessary but not sufficient conditions for aid to be effective for growth.

#### **7.4.4 Panel Data Analysis.**

The advantage of using panel data techniques is that it contains “the information necessary to deal with both the intertemporal dynamics and the individuality of the entities being investigated” (Dielman, 1989). This technique allows the equation intercepts to vary as a way of representing country and/or time effects. These country or time effects “are typically thought to arise from the omission of important variables whose explicit inclusion in the model was not possible”<sup>8</sup>.

A general representation of the model is designed as follows:

$$Y_{it} = \mu_i + \beta'X_{it} + \varepsilon_{it} \quad (7.3)$$

where  $\varepsilon_{it}$  takes different forms and  $\mu_i$  is described as we proceed, and  $\varepsilon_{it}$  is the classical disturbance with mean zero and constant variance. Note that the  $X$  matrix also includes the  $Z$  variables discussed earlier. To allow for country and time period effects equation 7.3 can be rewritten as:

$$Y_{it} = \alpha_0 + \alpha_i + \lambda_t + \beta'X_{it} + \varepsilon_{it} \quad (7.4)$$

where  $\alpha_0$  is an overall constant,  $\alpha_i$  represents the country effects and  $\lambda_t$  represents the time period effects. As indicated these represent unmeasurable effects, for instance,  $\alpha_i$  represents the net effect of omitted time-invariant variables such as political instability, military governments, climatic conditions, etc., and  $\lambda_t$  would represent the net effect of country-invariant time effects such as commodity prices or interest rates.  $\varepsilon_{it}$ , hence, represents the net effect of omitted variables which vary over both country and time. Equation 7.4 is a two-way fixed effects model. This type of model is usually estimated by using dummy variables, hence the name least squares dummy variables (LSDV). Due to limited time series data for all the variables we have averaged

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<sup>8</sup> Ibid. pp 49.

the data into four time periods. The time periods are 1970-75, 1976-81, 1982-87 and 1988-93, and they are named as PER1, PER2, PER3 and PER4 respectively (therefore  $t = 1, 2, 3, 4$ ). An advantage of using averages in the case of testing the impact of foreign aid on growth is that we are not certain whether foreign aid disbursed in a particular year has an immediate impact on growth in that particular year or later. There are 63 countries in the sample, (therefore  $i = 1, 2, \dots, 63$ ). Note that for some time periods some data were not available and we therefore used an unbalanced panel dataset. The total number of observations are 238.

Following Hadjimichael *et al.* (1995) we set out to test a non-linear relationship between foreign aid and growth similar to the cross-section model. We can hence compare the results from the cross-section with those of the panel data. For the panel data, the model to be estimated is in the following form:

$$\text{Growth}_{it} = \alpha_0 + \alpha_i + \lambda_t + \beta_{1i} \text{FAIDOECD}_{it} + \beta_{2i} \text{FAIDOECD}_{it}^2 + \beta_{3i} \text{PRIV}_{it} + \beta_{4i} \text{SAV}_{it} + \beta_{5i} \text{OTHERIFS}_{it} + \beta_{6i} \text{ZTOT1}_{it} + \beta_{7i} \text{MONEY}_{it} + \beta_{8i} \text{BSUR}_{it} + \beta_{9i} \text{INFSTD}_{it} + \varepsilon_{it} \quad (7.5)$$

The variables are as defined earlier. In this model since we use period averages we have substituted the weighted openness measure (WOPEN) by changes in the terms of trade (ZTOT1). This seems to be a reasonable measure of openness as many developing countries experienced major terms of trade shocks during the phases between the period 1970-93. Another advantage of using this variable as Fischer (1993) mentioned is that it also accounts for macroeconomic performance.

**7.4.5 Panel Results.**

The estimated parameters of the above model are reported in Table 7.10. (The country and time dummies are not reported below, the full output of the model is available from the author on request).

The foreign aid coefficient is positive and significant at the 5 % level but the square of foreign aid to GDP ratio carries a significant negative sign. The latter implies that too much foreign aid hurts developing countries beyond a certain threshold level. We also observe that, *ceteris paribus*, net private flows have a higher impact on growth individually than other sources of capital.

**Table 7.10: Two-way fixed effects model (OLS).**

Number of observations: 238 ; Parameters: 76 ; Degrees of Freedom : 162				
Residual Sum of Squares: 875.44				
$R^2 = 0.63775$ ; $\bar{R}^2 = 0.47004$ ; $F [ 75, 162 ] = 3.80***$				
Independent Variables	Coefficient	Standard Error	t-ratio	Probability Value
FAIDOECD	0.17604	0.08021	2.195**	0.029
FAIDOECDSQ	-0.001963	0.00095	-2.064**	0.040
PRIV	0.39631	0.08218	4.822***	0.000
SAV	0.018366	0.04027	0.456	0.648
OTHERIFS	0.45762	0.00842	0.543	0.587
ZTOT1	0.070834	0.03049	2.323**	0.021
MONEY	0.008783	0.02329	0.377	0.707
BSUR	-0.03128	0.04294	-0.729	0.467
INFSTD	-0.001203	0.00053	-2.282**	0.023
Constant	1.7166	1.2873	1.334	0.184

Note: \* significant at least at the 10 % level.

\*\* significant at least at the 5 % level.

\*\*\* significant at least at the 1 % level.



As we have suspected, its contribution on growth was not being picked up in the cross-section model. Taking the time factor into consideration gives an appropriate indication in the panel model. The coefficient of net private flows is positive and significantly different from zero. Testing whether this non-linear relationship with the quadratic term improves the fit, we re-run the model without the quadratic term and performed an F-test. The resulting F test supports the inclusion of the quadratic term, the calculated F-value being 4.24 and significant at the 5 % level. The drawback, however, of using such a model is the large loss of degrees of freedom. One way of reducing this loss is to arrange the data using time periods and to include regional dummies for Latin American and Caribbean (LAT) and for Sub-Saharan Africa (SSA). Hence it is as if running a one way fixed-effect model with these regional dummies. The results are presented in Table 7.11.

Despite a fall in the coefficient of foreign aid from 0.17604 to 0.10532 it is still significant at the 5% level. The macroeconomic variables: changes in the terms of trade, budget surplus and the inflation volatility perform rather well and have their expected signs. Also we can observe that the regional dummies and the time period effects are significant in the regression. For the latter we can infer that, *ceteris paribus*, growth was lower during the debt crisis (period 2) for the Latin American and Caribbean region compared to other developing countries in any other period.

**Table 7.11: One-way fixed effect model with regional dummies (OLS).**

Number of observations: 238 ; Parameters: 15 ; Degrees of Freedom : 223				
Residual Sum of Squares: 1506.49				
$R^2 = 0.38045$ ; $\bar{R}^2 = 0.34155$ ; $F [ 14, 223 ] = 9.78***$				
Independent Variables	Coefficient	Standard Error	t-ratio	Probability Value
FAIDOECD	0.10532	0.04852	2.170**	0.031
FAIDOECDSQ	-0.001284	0.00066	-1.937*	0.054
PRIV	0.23379	0.06739	3.469***	0.001
SAV	0.065115	0.02176	2.992***	0.003
OTHERIFS	0.006064	0.00772	0.782	0.433
ZTOT1	0.086528	0.02949	2.934***	0.004
MONEY	0.0086517	0.01112	0.778	0.437
BSUR	0.067342	0.03576	1.883*	0.0609
INFSTD	-0.001454	0.00049	-2.922***	0.004
LAT	-1.6470	0.47584	-3.461***	0.001
SSA	-1.7307	0.50081	-3.456***	0.001
Estimated Fixed Effects				
	Group Size	Coefficient	Standard Error	t-ratio
Period 1	58	4.4444	0.74351	5.978***
Period 2	63	3.4385	0.80671	4.262***
Period 3	62	2.3451	0.8589	2.730***
Period 4	55	2.7829	0.89526	3.108***

Note: Details as in Table 7.10.

When comparing these with the cross section results in Table 4 we notice that foreign aid is significant and positive in both cases while its effectiveness is higher in the cross-section case. An important result as mentioned above is when we use the panel framework to take the time factor into consideration as compared with the cross-section period average over the period 1970-93. This

was our suspected effect of net private capital flows which was not being picked up due to its observed trend as explained earlier. The panel formulation confirms this hypothesis and when the time factor is considered the coefficient of private flows becomes positive and highly significant, a result which we obtained when we split the cross-section data into different time periods.

When assessing the effectiveness of different sources of capital using either cross-section or pooled data we find that foreign capital (foreign aid and private capital net flows) has a greater impact than domestic savings when comparing individual coefficients. These results were also obtained by Papanek (1972) and Dowling and Hiemenz (1983). There is no doubt that net private capital flows have a greater impact than foreign aid as these flows are mostly directed to projects and activities with higher private rates of returns while the latter is mainly directed towards infrastructure building, education, health, communication, water supply and so on whose rates of return are observed in the longer run (the social rate of return in this case is much higher).

Coming to the model specification the fixed-effect models we estimated suffer some drawbacks, for instance, using up a large number of degrees of freedom and the coefficients of the dummy variables are not easily interpretable. They represent, as Maddala (1971) pointed out, “some ignorance—just like the residuals  $\varepsilon_{it}$ ”. Variables that might cause the regression line to shift are not specified; dummy variables are simply inserted to measure such shifts. Maddala suggested that this “specific ignorance” might just as well be treated in a manner similar of our “general ignorance” ( $\varepsilon_{it}$ ). In other words, the coefficients  $\alpha_i$  and  $\lambda_i$  could be viewed as normally distributed random variables with zero mean and unknown variance (from Dielman, 1989, pp. 53). Such a model has become known as random effect, variance components or error components model and is in the following form:

$$Y_{it} = \alpha_0 + \beta'X_{it} + \varepsilon_{it} + \mu_i \quad (7.6)$$

where  $\mu_i$  is treated as an individual specific disturbance and  $E[\mu_i] = 0$ ,  $\text{Var}[\mu_i] = \sigma^2_{\mu}$ , and  $\text{Cov}[\varepsilon_{it}, \mu_i] = 0$ . The model is estimated using a feasible generalised least squares procedure (GLS). The main advantage of this technique is that it accounts for heterogeneity (country or time depending how the model is specified). The results when allowing for both country and time heterogeneity are given in Table 7.12 below.

**Table 7.12: Two-Way Random effects model (GLS).**

Number of observations: 238 ; Parameters: 10 ; Degrees of Freedom : 228				
Residual Sum of Squares: 1828.76				
GLS $R^2 = 0.247908$ ; OLS $R^2 = 0.23745^9$				
Independent Variables	Coefficient	Standard Error	t-ratio	Probability Value
FAIDOECD	0.09386	0.04392	2.137**	0.033
FAIDOECD SQ	-0.001156	0.00056	-2.050**	0.040
PRIV	0.31382	0.05880	5.337***	0.000
SAV	0.04663	0.02303	2.025**	0.043
OTHERIFS	0.003819	0.00639	0.598	0.549
ZTOT1	0.085334	0.02325	3.670***	0.000
MONEY	0.018377	0.01166	1.576	0.115
BSUR	-0.004548	0.03083	-0.148	0.883
INFSTD	-0.0013295	0.00040	-3.311***	0.001
Constant	1.5991	0.96405	1.659*	0.097

Note: Details as in Table 7.10.

One can still see a positive contribution of foreign aid (and other sources of capital) on growth. Because we found that from both, the cross-section and fixed effects regressions, the growth effects were different in different time periods we now estimate Equation 7.6 with the inclusion of the regional dummies. This means that the data are arranged in a similar fashion as when

<sup>9</sup> The OLS  $R^2$  is reported as a more approximation of the "goodness of fit". Note that in using the feasible GLS the  $R^2$  no longer has its usual interpretation (see Judge and others, 1985, pp 31).

running the one-way fixed effect model. Thus the GLS is produced in two steps. First, ordinary least-squares is used to estimate the regression equation with the pooled data. The residuals from this step are then used to calculate the standard deviation of the residuals for each time period. Then the standard deviation for each time period is used to scale all the included variables for that time period. An OLS procedure is applied again to the pooled transformed data to obtain the feasible GLS estimators. The results using the error components model are presented in Table 7.13.

When we compare the results of the fixed-effect model in Table 7.11 with the GLS one, we find that the explanatory power is almost identical. The magnitude and significance of the parameters differ little. Although the coefficient of foreign aid falls slightly under the GLS method foreign aid effectiveness is almost the same (see Table 7.17) in both cases. Overall we can conclude that the results are quite similar whether we use the one-way fixed effect or random effect model with regional dummies.

Although there are advantages and disadvantages associated with each estimation method (see Greene, 1993, pp. 479) yet the slope coefficients are still assumed constant for all countries. So far we have found out that there are county group or regional effects either when using cross-section or pooled data, these motivate us to test for foreign aid effectiveness in the Latin American and Caribbean and Sub-Saharan African region since in our sample we have a large proportion of countries in these two regions. In doing so we use the GLS procedure but this time to account for country heterogeneity in each region. The GLS procedure will therefore be, first, to apply ordinary least-squares to the pooled data. The residuals from this step are then used to calculate the standard deviation of the residuals for each country. Then the standard deviation for each country is used to scale all the included variables for that country. Then an OLS procedure is applied again to the pooled transformed

data to obtain the feasible GLS estimators. To take account of the time periods we incorporate time period dummies PER2, PER3 and PER4.

**Table 7.13: Generalised Least Squares Regression with regional dummies.**

Number of observations: 238 ; Parameters: 12 ; Degrees of Freedom : 226				
Residual Sum of Squares: 1647.99				
GLS $R^2 = 0.322251$ ; OLS $R^2 = 0.334395$				
Independent Variables	Coefficient	Standard Error	t-ratio	Probability Value
FAIDOECD	0.10127	0.04489	2.256**	0.024
FAIDOECD SQ	-0.001235	0.0061	-2.012**	0.044
PRIV	0.23713	0.06240	3.800***	0.000
SAV	0.06391	0.02017	3.168***	0.002
OTHERIFS	0.00595	0.00716	0.830	0.406
ZTOT1	0.08977	0.02725	3.294***	0.001
MONEY	0.00744	0.01026	0.725	0.468
BSUR	0.06606	0.03308	1.997**	0.046
INFSTD	-0.00148	0.00046	-3.199***	0.001
LAT	-1.6667	0.44131	-3.777***	0.000
SSA	-1.7345	0.46473	3.732***	0.000
Constant	3.3342	0.91359	3.650***	0.000

Note: Details as in Table 7.10.

Table 7.14 presents the results for the Latin American and Caribbean region. The foreign aid variable has a larger coefficient than for the whole sample of developing countries and is significant at the 10 % level. But the square of the foreign aid variable carries a significant negative sign at the 5 % level. Note that the domestic savings ratio is not significant which might suggest that individually foreign capital has more impact on growth than domestic sources. An unusual outcome is the coefficient of financial liberalisation proxy, MONEY, which is negative and significant. A possible explanation could be that because we used nominal instead of real money stock (M2) as a ratio of

GDP as inflation rates for countries in this region were abnormally high. This result should also be considered carefully because there might be a case for financial repression, as we pointed out earlier in the case of Argentina (World Bank, 1990, pp. 101), where the government, for instance, needs resources to finance its deficit in order to support macroeconomic stability.

**Table 7.14: Generalised Least Squares Regression for Latin American and Caribbean region.**

Number of observations: 74 ; Parameters: 13 ; Degrees of Freedom : 61				
Residual Sum of Squares: 261.06				
GLS $R^2 = 0.598965$ ; OLS $R^2 = 0.61077$				
Independent Variables	Coefficient	Standard Error	t-ratio	Probability Value
FAIDOECD	0.21840	0.12046	1.813*	0.070
FAIDOECD SQ	-0.002453	0.00127	-1.927*	0.054
PRIV	0.37362	0.10402	3.592***	0.000
SAV	-0.010875	0.04808	-0.226	0.821
OTHERIFS	-0.00933	0.00962	0.970	0.334
ZTOT1	0.11359	0.04705	2.414**	0.016
MONEY	-0.01454	0.02641	-1.718*	0.086
BSUR	0.08568	0.04669	1.835*	0.067
INFSTD	-0.12619	0.00037	-3.374***	0.001
PER2	-0.7006	0.61405	-1.141	0.254
PER3	-2.2750	0.69196	-3.288***	0.001
PER4	-1.3731	0.67206	-2.043**	0.021
Constant	5.3826	1.3276	4.052***	0.000

Note: Details as in Table 7.10.

The variables accounting for macroeconomic performance are in line with our discussion and expectations. Among the time dummies, *ceteris paribus*, period three (PER3) which accounts for the debt crisis phase generates a lower growth

than other periods (the constant in this regression is the growth rate for period one (1970-1975)).

In the case of Sub-Saharan African region, the results are given in Table 15. Immediately one can notice a lower coefficient (0.19652) than in the Latin American and Caribbean case. The coefficient is marginally significant at the 10% level, while its square is not.

**Table 7.15: Generalised Least Squares Regression for Sub-Saharan African region.**

Number of observations: 90 ; Parameters: 13 ; Degrees of Freedom : 77				
Residual Sum of Squares: 756.04				
GLS $R^2 = 0.337226$ ; OLS $R^2 = 0.37536$				
Independent Variables	Coefficient	Standard Error	t-ratio	Probability Value
FAIDOECD	0.19652	0.12286	1.600	0.109
FAIDOECD SQ	-0.002352	0.00265	-0.887	0.375
PRIV	0.32432	0.11299	2.870***	0.004
SAV	0.04372	0.04015	1.089	0.276
OTHERIFS	0.00302	0.01038	0.291	0.771
ZTOT1	0.09460	0.04763	1.986**	0.047
MONEY	0.02273	0.03251	0.699	0.484
BSUR	-0.03693	0.06020	-0.613	0.539
INFSTD	-0.00359	0.00192	-1.872*	0.061
PER2	-2.0316	0.79015	-2.571***	0.010
PER3	-2.6074	0.85664	-3.044***	0.002
PER4	-2.6458	1.006	-2.644***	0.008
Constant	1.8498	1.44376	1.287	0.198

Note: Details as in Table 7.10.

To see whether these two regions' coefficients are all the same, a Chow test was performed based on the residuals sum of squares. The test indicated that



we could not reject the null hypothesis that the coefficients are the same at the 10% level (the F-value being 0.67 with degrees of freedom 13 and 138). Hence, statistically, we can argue that foreign aid effectiveness is the same in both regions. The pooled panel result is given in Appendix 7.3 in Table 7.15A.

Just like we tested aid effectiveness for different country groupings in the cross-section analysis, a similar investigation is carried out using panel data. The results are presented in Table 7.16 using the generalised least squares estimation technique. The interesting result is that it reinforces the finding from cross-sectional analysis that foreign aid is more effective in middle income countries than in the low income country group. Not only that, from the table we can observe that high aid inflows (foreign aid above the median value) have a positive impact on growth. These results could lead us to suggest that for foreign aid to be effective it should be above a certain threshold level and that the recipient country also should be above a certain minimum level of economic development. Does it mean that low income countries should not receive aid? Certainly not. Aid should still be given, for instance, to alleviate poverty which impedes economic development. Our arguments about aid's effectiveness are based on its contribution to growth, not necessarily capturing all the facets of economic development so that we cannot judge in fairness. More work in relation to aid's contribution to economic development should be carried out.

**Table 7.16: GLS Panel Regressions for different groupings.**  
**Dependent Variable: GDP Growth rate.**

Independent Variables	Low Income Countries	Middle Income Countries	Low Foreign Aid Receivers	High Foreign Aid Receivers
Constant	3.6378 (0.000)***	2.7549 (0.012)**	3.7198 (0.001)***	1.9874 (0.065)*
FAIDOECD	-0.091347 (0.301)	0.23091 (0.010)***	0.0079192 (0.984)	0.17863 (0.010)***
FAIDOECD SQ	0.002104 (0.279)	-0.002579 (0.008)***	0.01124 (0.836)	-0.002032 (0.017)**
PRIV	0.21327 (0.084)*	0.35506 (0.000)***	0.57814 (0.000)***	0.18834 (0.032)**
SAV	0.01502 (0.705)	0.06058 (0.070)*	0.014711 (0.669)	0.062001 (0.106)
OTHERIFS	-0.002812 (0.730)	0.011125 (0.358)	0.004545 (0.569)	0.004595 (0.682)
ZTOT1	0.12380 (0.010)***	0.042935 (0.192)	0.058588 (0.052)*	0.10581 (0.016)**
MONEY	0.018523 (0.347)	0.016365 (0.330)	0.008576 (0.569)	0.02294 (0.319)
BSUR	-0.01357 (0.802)	-0.005932 (0.894)	-0.00337 (0.930)	0.040544 (0.464)
INFSTD	-0.004217 (0.005)***	-0.000999 (0.035)**	-0.002685 (0.000)***	-0.000629 (0.316)
PER2	-0.2554 (0.678)	-1.5960 (0.004)***	-1.3419 (0.008)***	-1.004 (0.124)
PER3	-0.68078 (0.309)	-3.2669 (0.000)***	-2.3541 (0.000)***	-2.2957 (0.001)***
PER4	-0.16311 (0.836)	-2.0514 (0.001)***	-0.97803 (0.070)*	-2.3379 (0.006)***
GLS R <sup>2</sup>	0.263888	0.371122	0.35566	0.296242
OLS R <sup>2</sup>	0.28441	0.40089	0.40676	0.318110
RSS	417.46	1084.97	849.36	761.47
N	98	140	125	113

Note: Details as in Table 7.10.

### **7.5 Conclusion of Foreign Aid Effectiveness on Growth.**

The econometric approach adopted to test the effectiveness of foreign aid on growth has led to new results either when using cross-section or panel data methods: Foreign aid contribution on growth is positive. Tables 7.17 and 7.18 summarise the results of the impact and effectiveness of foreign aid on growth using both approaches respectively.

Some of the reasons for obtaining significant and positive effects of foreign aid on growth have been outlined in the cross-section part such as sample composition, size, gestation lags, etc.. To support our conclusion that foreign aid is found to be effective when we include the trade liberalisation period (1987-93), we have run a panel regression for the pre-trade liberalisation phase (i.e.  $t = 1, 2$  and  $3$ ). We found no relationship between foreign aid and growth, as with other studies. Hence it is quite reasonable to speculate that foreign aid effectiveness has begun to be observed mainly because of its gestation time periods, the nature of investment projects and the external environment which play a vital part in determining aid effectiveness.

Table 7.17: Summary results of Foreign Aid Impact on GDP Growth.

Cross-section Regression Results: Ordinary Least Squares (OLS)		Panel Regression Results: (OLS and Generalised Least Squares (GLS))	
	FAIDOECD	FAIDOECD	FAIDOECD
Whole Sample Period (1970-1993)	0.19869 (0.074)*	-0.004168 (0.286)	-0.001963 (0.040)**
Augmented Barro-Type Regression	0.25630 (0.029)**	-0.006816 (0.107)	-0.001284 (0.054)*
			-0.001156 (0.040)**
			-0.0012348 (0.44)**
			-0.002453 (0.054)*
			-0.002352 (0.375)
			-0.00162 (0.017)**
Low Income Countries	0.05174 (0.778)	-0.003536 (0.590)	0.0021038 (0.279)
Middle Income Countries	0.33483 (0.064)*	-0.008515 (0.275)	-0.002579 (0.008)***
Low Foreign Aid Receivers	0.70193 (0.526)	-0.10660 (0.715)	0.01124 (0.836)
High Foreign Aid Receivers	0.34150 (0.165)	-0.010497 (0.195)	-0.002032 (0.017)**

Note: Details as in Table 7.10.

Table 7.18: Summary results of Foreign Aid Effectiveness on GDP Growth.

Cross-section Regression Results: Ordinary Least Squares (OLS)			Panel Regression Results: (OLS and Generalised Least Squares (GLS))		
	Mean of FAIDOECD	Foreign Aid Effectiveness		Mean of FAIDOECD	Foreign Aid Effectiveness
Whole Sample Period (1970-1993)	6.4911	0.19869	Two-Way Fixed Effect Model (OLS)	6.7077	0.14971
Augmented Barro-Type Regression	6.4911	0.25630	One-Way Fixed Effect (OLS) (with Regional Dummies)	6.7077	0.08095
			Two-Way Random Effects (GLS)	6.7077	0.07835
			GLS (Random Effect Model with Regional Dummies)	6.7077	0.0847
			GLS Regression for Latin American and Caribbean Region	3.1397	0.2029966
			GLS Regression for Sub-Saharan African Region	11.777	0.19652
			GLS Regression Pooling LAT and SSA	7.8795	0.11014
Low Income Countries	10.3921	0	GLS Regression for Low Income Countries	10.9929	0
Middle Income Countries	3.5358	0.33896	GLS Regression for Middle Income Countries	3.7080	0.21178
Low Foreign Aid Receivers	1.3524	0	GLS Regression for Low Foreign Aid Receivers	1.4195	0
High Foreign Aid Receivers	12.3912	0	GLS Regression for High Foreign Aid Receivers	12.5575	0.12596

Note: Details as in Table 7.10.

## APPENDIX 7.1

Table 7.3 : Correlation Matrix: Period Average 1970-93

	Growth	Faid-oecd	Faid-oecd-sq	Faidwb	Offlows	Oecdpop	Priv	Sav	Otherifs	Money	Exp	Bsur	Inf	Infstd
Faidoecd	-0.177	1.000												
Faidoecd-sq	-0.162	0.939	1.000											
Faidwb	-0.172	0.971	0.949	1.000										
Offlows	-0.167	0.895	0.910	0.947	1.000									
Oecdpop	0.065	0.596	0.496	0.608	0.497	1.000								
Priv	0.144	-0.129	-0.089	-0.086	-0.212	0.176	1.000							
Sav	0.426	-0.522	-0.384	-0.446	-0.395	-0.106	0.512	1.000						
Otherifs	-0.002	0.056	0.022	0.030	0.054	-0.050	-0.074	-0.127	1.000					
Money	0.367	-0.319	-0.263	-0.274	-0.263	-0.054	0.252	0.403	0.003	1.000				
Exp	0.152	0.004	-0.207	0.013	-0.012	0.382	0.396	0.430	0.016	0.568	1.000			
Bsur	0.339	-0.127	-0.087	-0.127	-0.136	-0.105	0.036	0.057	-0.158	-0.333	-0.534	1.000		
Inf	-0.290	0.061	0.199	0.157	0.234	-0.143	0.019	0.042	-0.057	-0.288	-0.240	0.046	1.000	
Infstd	-0.265	0.197	0.346	0.321	0.410	-0.071	0.014	0.019	-0.044	-0.269	-0.258	0.072	0.950	1.000
Wopen	0.282	-0.187	-0.151	-0.164	-0.176	-0.034	0.313	0.325	-0.197	0.082	0.192	0.109	-0.067	-0.073

## APPENDIX 7.2

**Table 7.4A: Cross Section Regressions (OLS): Alternative measures of openness (N=58). Dependent Variable: Average GDP Growth 1970-93.**

Independent Variables	Column 2A	Column 2B	Column 2C
Constant	1.6025 (0.182)	2.5638 (0.016)**	2.9149 (0.006)***
FAIDOECD	0.20484 (0.063)*	0.21122 (0.062)*	0.17176 (0.137)
FAIDOECD SQ	-0.004129 (0.231)	-0.004657 (0.192)	-0.00251 (0.544)
PRIV	-0.19063 (0.155)	-0.23041 (0.076)*	-0.10310 (0.466)
SAV	0.1360 (0.001)***	0.12636 (0.001)***	0.12845 (0.000)***
OTHERIFS	0.01618 (0.057)*	0.01798 (0.037)**	0.02046 (0.176)
TTAX	0.05551 (0.147)	-	-
LNBMP	-	-0.66334 (0.256)	-
OPEN1	-	-	-0.04097 (0.053)*
MONEY	0.039607 (0.007)***	0.037006 (0.013)**	0.039328 (0.020)**
BSUR	0.3117 (0.000)***	0.30941 (0.000)***	0.27461 (0.000)***
INFSTD	-0.000959 (0.015)**	-0.0009286 (0.024)**	-0.001368 (0.031)**
DUM3	-1.1074 (0.066)*	-1.1948 (0.039)**	-1.2784 (0.025)**
DUM6	-1.3830 (0.003)***	-1.2922 (0.006)***	-1.2193 (0.037)**
R <sup>2</sup>	0.61405	0.61155	0.63712
Adj. R <sup>2</sup>	0.52175	0.51866	0.55035
F	6.65***	6.58***	7.34***
RSS	94.82	95.44	89.15
Breusch-Pagan $\chi^2$	18.53*	17.75*	12.89
Jarque-Bera statistic	2.73	3.50	2.44

Note: Details as in Table 7.4. Probability values in brackets.

TTAX is total international trade taxes divided by total trade.

LNBMP is the defined as  $\ln(1+BMP)$  where BMP is the black market exchange rate premium. The data is from Barro and Lee (1994).

OPEN1 is average of export and import as a proportion of GDP.

**Table 7.4B: Cross Section Regressions (OLS): Alternative measures of openness (N=58). Dependent Variable: Average GDP Growth 1970-93.**

Independent Variables	Equation 2D	Equation 2E	Equation 2F
Constant	2.3514 (0.021)**	1.6937 (0.145)	2.3535 (0.0261)
FAID	0.20988 (0.055)*	0.21794 (0.066)*	0.20158 (0.092)*
FAIDOECD SQ	-0.004396 (0.224)	-0.005089 (0.225)	-0.004259 (0.319)
PRIV	-0.18684 (0.200)	-0.21919 (0.113)	-0.1987 (0.154)
SAV	0.12918 (0.000)***	0.12964 (0.000)***	0.12780 (0.000)***
OTHERIFS	0.018052 (0.063)*	0.015704 (0.310)	0.017703 (0.259)
OPEN2	-0.002745 (0.772)	-	-
TGG	-	0.06030 (0.222)	-
ZTOT1	-	-	-0.01702 (0.853)
MONEY	0.038898 (0.011)**	0.037185 (0.032)**	0.03781 (0.032)**
BSUR	0.31587 (0.000)***	0.2948 (0.000)***	0.31884 (0.000)***
INFSTD	-0.001026 (0.012)**	-0.0008898 (0.145)	-0.000994 (0.110)
DUM3	-1.2100 (0.049)**	-1.2174 (0.036)**	-1.2446 (0.035)**
DUM6	-1.3210 (0.008)***	-1.3561 (0.023)**	-1.3591 (0.025)**
R <sup>2</sup>	0.60656	0.61880	0.60639
Adj. R <sup>2</sup>	0.51248	0.52764	0.51227
F	6.45***	6.79***	8.44***
RSS	96.66	93.66	96.70
Breusch-Pagan $\chi^2$	18.47*	14.22	16.46
Jarque-Bera statistic	3.09	1.09	3.90

Note: Details as in Table 7.4. Probability values in brackets

OPEN2 is the openness measure as defined in the Penn World Table Mark 5.5.

TGG is the rate of growth of total trade as a percentage of GDP.

ZTOT1 is the log difference of the change in the terms of trade.



**APPENDIX 7.3****Table 7.15A: Generalised Least Squares Regression Pooling Latin American and Caribbean and Sub-Saharan African countries.**

Number of observations: 164 ; Parameters: 13 ; Degrees of Freedom : 151				
Residual Sum of Squares: 1080.88				
GLS $R^2 = 0.39763$ ; OLS $R^2 = 0.40433$				
Independent Variables	Coefficient	Standard Error	t-ratio	Probability Value
FAIDOECD	0.13567	0.05215	2.602***	0.009
FAIDOECD SQ	-0.00162	0.00068	-2.397**	0.017
PRIV	0.36351	0.08256	4.403***	0.000
SAV	0.032753	0.02914	1.124	0.261
OTHERIFS	0.004947	0.00785	0.630	0.529
ZTOT1	0.088159	0.03636	2.425**	0.015
MONEY	0.009099	0.02054	0.443	0.658
BSUR	0.04445	0.0408	1.089	0.276
INFSTD	-0.001243	0.00492	-2.526**	0.012
PER2	-1.5318	0.56993	-2.688***	0.007
PER3	-2.6479	0.61205	-4.326***	0.000
PER4	-2.1180	0.65555	-3.231***	0.001
Constant	3.045	0.86773	3.509***	0.000

Note: Details as in Table 7.10.

# Chapter Eight

Aid, Savings  
and  
Investment

# **Chapter Eight**

## **FOREIGN AID, DOMESTIC SAVINGS AND INVESTMENT**

### **8.1 Introduction**

In the previous chapters, from the growth model of Harrod-Domar through the Solow-Swan neo-classical to the endogenous growth models capital accumulation was the major theme. In fact the 1990s have seen a renewed interest in issues of capital accumulation and growth. The association between gross domestic investment ratios and long-term growth performance is well established. Levine and Renelt (1992) find that the ratio of physical investment to GDP is the only robust regressor in their sensitivity analysis. Although empirical literature supports the view that investment may not be the sole engine of growth, it continues to place capital accumulation at the centre of the growth process (see Schmidt-Hebbel *et al.* (1996) for a review of studies). Physical investment is seen as a necessary, but not sufficient, condition for growth. Emphasis are also laid upon human capital investment, technological innovation, and appropriate policies for sustained high growth.

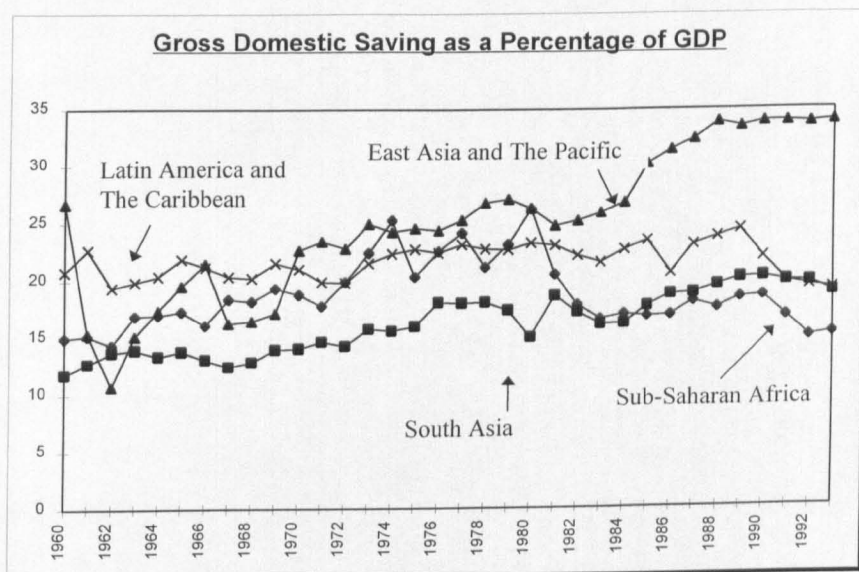
Thus from a theoretical and empirical point of view investment is necessary to economic growth and from this it follows, in a passive sense, that saving is necessary to growth, because investment has to be matched by saving<sup>1</sup>. Many studies have found strong positive correlation for example, Feldstein and Horioka (1980), Feldstein and Bacchetta (1991), Dooley *et al.* (1987) and Summers (1988). Across the regions, Figures 8.1 and 8.2 depict the correlation between domestic saving and investment as a percentage of GDP. When we compared domestic savings rate and the growth performance in Chapter 4 (see

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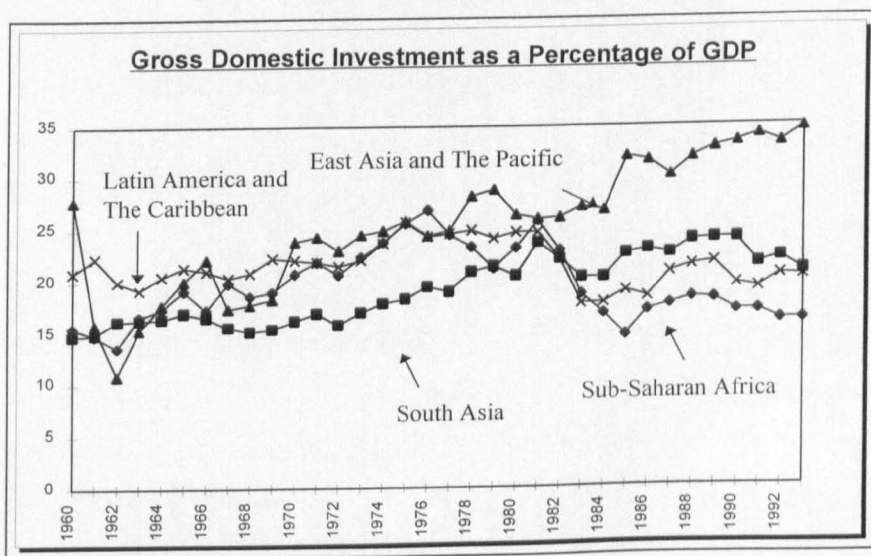
<sup>1</sup> But as Lewis (1955) argued it “remains open to ask whether the process of investment will not automatically create all the saving that is required, so that we need not worry about the level of savings, and can concentrate on investment”.

also the figures in Appendix 4.1), there seem to be an apparent implication for a policy to raise domestic saving to be a high priority to enhance growth (for instance take the case of the East Asia and the Pacific region). Schmidt-Hebbel *et al.* Argue that “ensuring adequate levels of saving remains a central policy concern.....to guarantee sufficient financing for capital accumulation”.

**Figure 8.1: Gross Domestic Savings as a Percentage of GDP.**



**Figure 8.2: Gross Domestic Investment as a Percentage of GDP.**



Since Griffin (1970) there has been a continuing debate about whether foreign capital inflows, foreign aid in particular, crowd out domestic savings, and on

the way foreign aid is spent on consumption and investment. This chapter elaborates on the relationship between foreign aid and savings and provides some evidence on the aid-investment relationship. Section 8.2 reviews Griffin's argument on foreign aid and domestic savings. In section 8.3 we review some of the existing empirical literature and provide some criticisms. Due to the problems entailed in the measurement of domestic savings we approach the issue of fungibility and implicitly test the aid-savings relationship using consumption theory. In this context, in section 8.4 we outline and extend the life-cycle/permanent income model for empirical estimation using panel data on the sample of developing countries identified earlier. The empirical results are also provided in the same section. Section 8.5 investigates into the aid-investment nexus built on a simple accelerator model. We specify and test the model to assess the effectiveness of foreign aid on investment. Section 8.6 provides some concluding remarks.

### **8.2 Griffin's Debate on Foreign Aid and Domestic Savings.**

Griffin (1970) criticised the critical assumptions on which the two-gap model is based, arguing that in the long run 'no country is so rigid that it can produce neither capital goods, nor exports nor import substitutes.....it is the unwillingness to reduce domestic consumption .....which is the source of the difficulty'. In this sense only savings is seen as the binding constraint on investment, not foreign exchange. He further argued that capital inflows will lead to an increase in current consumption (hence reducing domestic savings). His argument is that a recipient country will treat an anticipated aid inflow as an increase in income and, unless the marginal propensity to consume is zero, the resources will be allocated between both savings and consumption. Since the publication of Griffin's article many authors have expressed concerns about the way Griffin outlined his argument. Some of the critiques are summarised in Riddell (1987) and White (1992a). We review some of the main arguments here.

Kennedy and Thirwall (1971), Eshag (1971) and Stewart (1971) have all dismissed Griffin's argument that only savings is "the" binding constraint on growth as in the long run extra foreign exchange can be obtained by substitution of domestic production. Kennedy and Thirwall argue that substitution would incur costs in terms of lost output, and that the provision of foreign exchange through aid flows would increase output by utilising redundant domestic resources, hence, generating an increase in domestic savings without the need for thrift. Moreover, Eshag questions just how mobile resources are, alleging that developed countries such as the United Kingdom, France and Belgium did not attain adequate flexibility and mobility of resources to free themselves from the foreign exchange constraint to investment after a century and a half of industrialisation and diversification of economic activity.

Colman and Nixon (1978, 1994) stated that the relationship between domestic savings and foreign aid which Griffin derived is misleading. This is because he models consumption as being a function of income plus aid, with savings being a function of income alone. Once this is corrected a positive relationship emerges. But as White (1992a) argues both Griffin and Colman and Nixon's conclusions could be correct depending on whether a distinction is made between domestic and foreign savings (pp.177-8).

Moreover, Newlyn (1973) further criticised Griffin's representation for the absence of an economic model since only an accounting identity is being used. Criticisms of the model were numerous, for instance, the model does not allow any feedback effects where aid may increase income by more than the value of the inflow. In such a case there would be a positive feedback effect on domestic savings. Such an effect was formulated by Tendulkar (1975) where aid has the possibility of leading to higher levels of domestic savings through higher income. That is in Griffin's analysis the aid multiplier is one when elementary

textbooks tell us that at least under certain conditions, for e.g. underdeveloped resources, this is certainly not the case. In such a case the budget constraint will shift out not by the amount of the aid inflow but by the amount times the multiplier value. A high multiplier can increase the current savings level so that the relationship between aid and savings in the current period is positive.

Grinols and Bhagwati (1976), on the other hand, argued that in a dynamic context increased growth will exert a positive impact on savings although in their analysis they incorporated a negative relationship between aid and savings. Their simulation exercise suggests that on average it would take 40 years for developing countries' domestic savings to catch up with what they would have been in the absence of aid.

White (1992a) picked on an important issue which Griffin overlooked: tied aid. White showed theoretically a case where it is possible that all aid is tied to investment so that the country is forced to save a higher proportion of income than its marginal propensity to save. He also suggested that "aid will be less than perfectly fungible where (i) the ratio of aid to income is high, and (ii) where the share of savings (without aid) in national income is low" (pp. 180).

Kennedy and Thirwall pointed out that by using a social welfare function for an optimising economy as used by Griffin for which present and future consumption are normal goods, any increase in income will be divided partly between current and future consumption. On this assumption domestic savings will fall because of the way it is defined. This shows nothing beyond the effects of relaxing a domestic savings constraint as would be the case for foreign aid. Theoretically though total savings can increase by the full amount of the inflow, but they do not because the social planner is maximising social welfare. If all of an aid inflow is saved the economy would end up on a lower indifference curve. In such a case Stewart stated that 'the decline in domestic savings is not a reflection of the fecklessness of the people and their

government but of their wisdom in heading straight for the highest possible social welfare' (pp.143). Most of the authors criticised Griffin for relying too much upon the Harrod-Domar model of growth, which implies that only investment is beneficial to growth. Griffin ignores the view that some expenditure classified as consumption may have a high positive return or that some aid is typically designed to go to consumption, for example, food aid, health and emergency aid.

From the empirical point of view not only Griffin but other authors who have been testing the aid-savings relationship have received a lot of criticisms in terms of sample, data measurement, model specification and estimation techniques. The next section summarises some of the empirical findings along with some critiques.

### **8.3 Empirical Findings and Criticisms.**

Griffin's evidence is based on a simple cross-country bivariate linear regression between domestic savings and capital flows. Using a sample of 32 countries he found a negative relationship between the two variables. Similar tests were performed by Weisskopf (1972a, b) and Voivodas (1973). While the former concurred with Griffin's findings, the latter reported a positive relationship using time series for the South Korean case. Various defects were subsequently brought out. First, the current account deficit was used as a measure of capital inflows to derive conclusions for foreign aid. Further, as Papanek (1972,1973) and Over (1975) pointed out the authors conflated foreign aid with other foreign resource inflows. It should be noted, however, that foreign aid, the current account deficit and foreign capital inflows are not synonymous. Hence it would be preferable to concentrate on studies which distinguish among these flows. Second, many still ignore the data problems arising from using savings as an independent variable when it is often calculated as a residual. Mikesell and Zinser (1973) further argued that since gross domestic savings are based on



the *ex-post* gross domestic saving rates as calculated from the national income, any regression analysis based on such an *ex-post* accounting relationship between savings and capital inflows will show a negative correlation. Third, Stewart (1971) was among the first to point out that regression results should be taken with care as correlation does not necessarily mean causality. Dacy (1975) also argued that the issue of causality is most difficult to resolve especially if foreign aid is allocated on the basis of need, "then cross-country regressions of domestic savings on aid would produce a negative coefficient as long as growth and domestic savings are positively correlated" (pp. 549). Consequently we should not interpret the relationship to imply that foreign aid *caused* low domestic savings. Dacy also suggested that one needs to distinguish between the short-term and long-term impact of aid on recipient countries. In his simulation exercise he found that if aid does lead to an increase in consumption but does not fall back to its original level when aid is withdrawn, then the overall effect of aid will be to lead to an increase in domestic savings.

In a cross sectional analysis of 50 LDCs, Gupta (1970) found no significant relation between the savings rate and capital imports, and Gulati (1978) found that there is a lack of evidence on the supposedly adverse effect of capital transfers to LDCs on their savings and growth of incomes. Although Papanek (1973) found a positive relationship between aid and growth, a strong negative correlation between savings and aid was obtained, but he argued that it is more likely to be due to exogenous factors affecting both rather than a causal relationship. The model estimated was in the following form:

$$\text{Savings Rate} = \alpha + \beta_1 \text{Aid/GDP} + \beta_2 \text{Private Investment/GDP} + \beta_3 \text{Other Inflows/GDP} + \beta_4 \text{Primary Exports/GDP} + \beta_5 \text{Other Exports/GDP} + \varepsilon$$

It should, however, be noted that in this regression domestic savings is treated as a dependent variable while in his growth equation savings was one of the independent variables. The estimated parameters will hence be inconsistent and

biased. A simultaneous equation model could have shed more light of any feedback effect and relationship.

An important result emanates from Gupta and Islam (1983) comparison of single versus simultaneous regression models. When they used a single equation regression for a sample of 52 countries for the time period 1970, although foreign aid appeared to have no statistical effect on domestic savings, the negative coefficient of foreign aid was statistically significant at the 10% level in their so-called 'general model' which they defined as being a model to include variables other than capital flows (Table IV.2, pp. 44). The model was defined as:

$$\text{Domestic Savings Rate} = \alpha + \beta_1 \text{Aid/GNP} + \beta_2 \text{Foreign Private Investment/GNP} + \beta_3 \text{Other Inflows/GNP} + \beta_4 \text{Real per capita income} + \beta_5 \text{Dependency Rate} + \beta_6 \text{Growth of GNP} + \varepsilon$$

They also divided their sample into first, income groups: Group I (up to \$124), Group II (\$125 to \$249) and Group III (\$250 to \$675), second, into geographical groups: Asia, Africa and Latin America. For the income group decomposition, foreign aid had a positive impact on the savings ratio for Group II but was negative for Group III (Table IV.8, pp. 51). For the geographical regions, it was significant only for the Asian countries, but negative. When they used a simultaneous equation model consisting of nine equations, the 2SLS estimates of foreign aid was not statistically different from zero for the whole sample at the 10% level. When splitting the sample according to income and geographical groups they reported only the OLS estimates because they argued that the "2SLS estimates for the two groupings were invariably bad on the basis of usual statistical criteria". Not surprisingly, therefore, the same result were obtained for both groupings as when using single equations. The conclusion which is emerging from Gupta and Islam's findings is that foreign aid displaces domestic savings only for high income and Asian countries.

Rana (1987) proposed a simple two equation model consisting of a growth, and a savings, equation. The former was derived from the traditional export-augmented neo-classical production function of the one proposed by Feder (1982), while the latter was the traditional Keynesian-type augmented by exports, per capita income and the growth rate variables. They were as follows:

$$\text{Growth Rate} = \alpha_1 + \beta_1 \text{Aid/GDP} + \beta_2 \text{Foreign Private Investment/GDP} + \beta_3 \text{Savings/GDP} + \beta_4 \text{Change in Export/GDP} + \beta_5 \text{Change in labour force} + \varepsilon$$

$$\text{Savings/GDP} = \alpha_2 + \lambda_1 \text{Aid/GDP} + \lambda_2 \text{Foreign Private Investment/GDP} + \lambda_3 \text{Change in Export/GDP} + \lambda_4 \text{GDP per capita} + \lambda_5 \text{Growth of GDP} + v$$

The period of his study was 1965-82 using pooled data for the Asian countries. Using indirect least squares he found that studies considering only the direct effect of foreign capital (foreign aid and foreign private investment) in general, tended to overestimate the favourable effect of foreign capital on growth and exaggerate the adverse effects on domestic savings. When Rana disaggregated the sample by income levels, a rather unexpected outcome emerged. It was found that private foreign investment has contributed more than foreign aid to growth in the low income group while it is the other way round for the middle income countries. The results should, however, be interpreted with caution because a test performed by Ravallion and Sen (1986) for the period 1965-80 for 6 Asian countries suggested that the data should not be pooled. In fact they argued that there is considerable variation among the countries especially in the importance of their traditional agricultural sectors and that local capital is not very mobile. These generate high error variance from the residuals of the pooled data and many empirical studies have not corrected for this error structure.

Since then there have hardly been any studies using simultaneous equation models. Most of them still use single equation to test the aid-savings relationship. Although recent attention has turned to study government fiscal

behaviour (for example, Mosley *et al.* (1987)), as it is the government who receives the funds and decides how to allocate them, the savings debate still remains important. Gupta (1987) found positive coefficients on foreign savings that are significant for Latin America, although not for Asia. Sobhan and Islam (1988) found that in the short run overall aid has a negative effect on internal resource mobilisation in Bangladesh. Morisset (1989) re-examined the relationship between foreign capital inflows and domestic savings in the case of Argentina for the period 1960-81 and found that the estimated coefficient of foreign aid was not significant and that foreign capital inflows did not crowd out domestic savings by allowing domestic residents to consume more. Also Nord and others (1993) focused on a subset of more successful adjustment programs countries in Sub-Saharan Africa and concluded that large increases in foreign aid did not appear to have led to a decline in domestic savings rates. The World Bank (1994) found that high program adjusters during 1987-91 although part of foreign savings financed consumption, domestic savings rates improved during the period.

White (1992b) re-examined Griffin's model and showed that the negative impact of aid on savings is much less than he claimed. He highlighted also that the model used has nothing to say about the behavioural determinants of savings but collapses to an identity. He further argued that empirical work should be based on better-formulated macroeconomic models, which probably require simultaneous estimation and that it would be preferable that studies are carried out at the country level rather than employing cross-country data. Mosley and Hudson (1995) carried out some single country regressions using time series to test the impact of foreign aid on growth and domestic savings. They found that out of 14 countries, when the following model was estimated the period 1963-90:

$$\text{Savings Rate} = \alpha + \beta_1 \text{Aid/GNP}_{t-5} + \beta_2 \text{Other Financial Inflows/GNP}_{t-5} + \beta_3 \text{Growth of literacy} + \beta_4 \text{Inflation Rate} + v_t.$$

only in 2 cases was foreign aid negative and significant while being positive and significantly different from zero in 3 cases. When they substituted the real exchange rate for the inflation rate only in one case was it negative and different from zero, while being positive and significant in 4 countries.

Hajimichael *et al.* (1995) performed a savings regression using some macroeconomic indicators for 39 Sub-Saharan African countries. Their model being:

$$\begin{aligned} \text{Savings Rate} = & \alpha_i + \alpha_t + \beta_1 \text{Aid/GDP}_{it-1} + \beta_2 [\text{Aid/GDP}]^2_{it-1} + \beta_3 \text{Growth}_{it-1} \\ & + \beta_4 \text{Real GDP per capita}_{it-1} + \beta_5 [\text{Government Investment/GDP}]_{it-1} + \beta_6 \\ & \text{Inflation Rate}_{it-1} + \beta_7 [\text{Budget Deficit/GDP}]_{it-1} + \beta_8 [\text{Broad Money/GDP}]_{it-1} + \\ & \beta_9 \text{Change in terms of trade} + \beta_{10} [\text{External Debt/Exports}]_{it-1} + \beta_{11} [\text{External} \\ & \text{Debt/Exports}]^2_{it-1} + \beta_{12} \text{Dependency Ratio} + \beta_{13} \text{Dummy Variable for} \\ & \text{Sustained Adjusters} + \beta_{14} \text{Dummy Variable for countries with protracted} \\ & \text{imbalances} + \beta_{15} \text{Dummy Variable for CFA zone} + \varepsilon_{it}. \end{aligned}$$

The pooled data estimated coefficient of foreign aid on domestic savings was negative. However they found that the negative impact is concentrated in those countries with protracted imbalances and negative per capita growth, whereas for the group of sustained adjusters, foreign aid appeared to have stimulated domestic savings. Another recent study by Boone (1994) using panel data based on 97 developing countries found that the marginal propensity to consume from aid is insignificantly different from one, and the marginal propensity to invest is insignificantly different from zero. He concluded that “virtually all aid goes to consumption”. The problems in Boone’s regression are that first he incorporated too many dummy variables which makes interpretation difficult, second there is simultaneity bias as growth is sometimes being treated as an endogenous as well as an exogenous variable in separate regressions. Also there is no reason being given as to why the sample is split into different time periods. His sample also suffers from many outliers, for example small countries and very high aid receivers.

The conclusions that can be drawn from the empirical literature review are that empirical estimates of the effects on domestic savings of foreign aid vary widely with the sample, period of study, model specifications and model estimation techniques. In the next section we attempt, first, to use consumption theory to assess the impact of foreign aid and second, to estimate it using panel data.

#### **8.4 Foreign Aid and Consumption: An implication for domestic savings.**

##### **8.4.1 The Life-Cycle/Permanent Income Hypothesis.**

One important deduction that can be made from the empirical literature review of foreign aid's impact on domestic savings is the need to build a framework to enable an assessment of any linkage between aid and savings, either implicitly or explicitly, before performing any regression using those variables. Previous studies have regressed the savings rate on foreign aid and other capital inflows along with a series of variables which are thought to affect savings decisions. We intend to use some theoretical foundations to obtain a convincing argument about the impact of foreign aid on domestic savings. Early critics on aid's impact on savings (e.g. Griffin, 1970 and Griffin and Enos, 1970) have argued that aid flows will lead to an increase in consumption rather than investment. We start here from analysing how consumers will react to such inflows under certain assumptions.

Since decisions to consume affect decisions to save, an understanding of the theory of consumer behaviour can throw some light on the relationship between foreign aid and domestic savings. It becomes important to know how aid receiving countries treat foreign aid, whether they conceive it as an increase in current income (for consumption purposes) or as a supplement to domestic savings (for investment purposes). If they regard foreign aid as an increase in

income the question which arises is whether they treat this increment as transitory or permanent.

Traditionally, aggregate consumption function has been a key element of macro-models, as in for example the Keynesian absolute income hypothesis (Keynes, 1936). However, a number of problems associated with theoretical and empirical inadequacies of Keynes' model led economists to develop new hypotheses about consumer behaviour. Without doubt, the most influential of these, which have revolutionised consumption theory at the theoretical and empirical front have been the combination of the life-cycle and permanent income hypotheses. The life-cycle hypothesis of Modigliani and Brumberg (1954) states that real consumption expenditure depends on the total wealth of the consumer during the entire lifespan. Underlying the life-cycle hypothesis is the concept of intertemporal utility maximisation: economic agents attempt to smooth consumption over time, saving in their prime working years and dissaving during their retirement. With the permanent income hypothesis, Friedman (1957) postulates that current consumption is a fraction of permanent, and not current, income. Under both hypotheses the consumer might be expected to maintain a more or less constant, or perhaps slightly increasing level of consumption. The Life-Cycle/Permanent Income (LC/PI) hypothesis predicts that risk averse consumers will use the capital market to absorb transitory income changes, accumulating assets in booms and dissaving in slumps, in order to smooth life-time consumption (Olekalns, 1997). The use of the capital market (e.g. access to foreign aid and other types of capital flows in our context) to smooth consumption means that the current period's level of expenditure varies only in response to permanent changes in expected lifetime wealth. Hence if consumption depends on Life-Cycle/Permanent Income the marginal propensity to consume out of current income should be negligible. Under this model, demand management policies will shift consumption only if people believe that there has been a change to their total lifetime earnings.

The Life-Cycle/Permanent Income model gained much emphasis since the seminal work of Hall (1978). It is hypothesised that 'consumers form estimates of their ability to consume in the long run and then set current consumption to the appropriate fraction of that estimate' (Hall, 1978, pp. 971). Obtaining information about the 'estimate' has been unclear in empirical research, often a form of fixed distributed lag has been used, which has effectively been criticised by Lucas (1976) and also the 'estimated distributed lag is usually puzzlingly short' (Hall, 1978). To resolve such problems Hall incorporated rational expectations into the permanent income framework such that when consumers maximise expected future utility,... the conditional expectation of future marginal utility is a function of today's level of consumption alone—all other information is irrelevant' (pp. 972). In other words, future consumption growth should be orthogonal to variables in the consumer's current information set. In particular, consumption should not respond to predictable movements in income (Shea, 1995). Hence, consumption expenditure can be modelled to follow a random walk with drift where the current period's level of consumption differs from the previous period's level only by a random error term. This can be written more formally as<sup>2</sup>:

$$C_t = \alpha + \theta C_{t-1} + \varepsilon_t \quad (8.1)$$

where  $C_t$  is consumption expenditure in period  $t$ ,  $\alpha$  is a constant term and  $\theta = (1 + \rho)/(1 + r) = 1$  if  $\rho$ , the subjective rate of time preference, and  $r$ , the real return on assets, are equal.  $\varepsilon_t$  is the error term which is independently distributed<sup>3</sup>. Under the LC/PI hypothesis only consumption lagged one period should have a nonzero coefficient. This is because  $C_{t-1}$  embodies all information relating to permanent income that is known up until period  $t-1$ . Hence expected income in period  $t$ , conditional on the information set known in period  $t-1$  should enter with a zero coefficient if added to the right hand side

<sup>2</sup> For some recent developments in the LC/PI modelling see Campbell and Deaton (1989), Carroll (1994), Chyi and Huang (1997), Craigwell and Rock (1995), Patterson (1995), Shea (1995) and Zeldes (1989) among others.

<sup>3</sup> For an exposition of Hall's result using intertemporal optimising model see Muelbauer (1983) and Branson (1989).



of the equation. The model can be rewritten following Campbell and Mankiw (1990) as:

$$\Delta C_t = \alpha + \lambda \Delta Y_t^e + \varepsilon_t \quad (8.2)$$

where  $\Delta$  is the first differencing operator and  $Y_t^e$  is the expected level of income in period  $t$  conditional on information known in period  $t-1$ . This model can be estimated and under the Life-Cycle/Permanent Income hypothesis,  $\lambda = 0$ .

It is worth quoting Hall's implication for macroeconomic forecasting and policy analysis under the LC/PI hypothesis:

"If every deviation of consumption from its trend is unexpected and permanent, then the best forecast of future consumption is just today's level adjusted for trend. Forecasts of future changes in income are irrelevant, since the information used in preparing them is already incorporated in today's consumption. In a forecasting model, consumption should be treated as an exogenous variable. For policy analysis, the pure life cycle-permanent income hypothesis supports the modern view that only unexpected changes in policy affect consumption—everything known about future changes in policy is already incorporated in present consumption. Further, unexpected changes in policy affect consumption only to the extent that they affect permanent income, and then their effects are expected to be permanent. Policies that have transitory effect on income are incapable of having a transitory effect on consumption." (pp. 973).

Empirically, many studies have consistently found evidence against the Life-Cycle/Permanent Income hypothesis. In particular Flavin (1981) and Campbell and Mankiw (1990) found that the U.S. aggregate consumption tends to react to changes in the predictable component of aggregate income. In other words consumption is excessively sensitive to current income. Campbell and Mankiw (1990) found that a predictable one percent income increase leads to a statistically significant consumption increase of between 0.351 percent and 0.713 percent.

There are many factors that could explain the failure of the LC/PI hypothesis. For instance, Zeldes (1989) attributes such failure to the existence of liquidity constraints. In such a case individuals are denied credit and are unable to optimally smooth their consumption (Olekalns, 1997). Campbell and Mankiw (1989, 1991) further model a case where some fraction of the aggregate income belongs to agents who follow the 'rule of thumb' of consuming their current income; the rest of aggregate income is accrued to those agents consuming according to their permanent income levels. The existence of 'rule of thumb' has been found by Jappelli and Pagano (1989) and Campbell and Mankiw (1991) reflecting the imperfection of consumer credit markets. The rationale is that a liquidity-constrained agent is often forced to consume his/her current income, especially when the desired current consumption level is greater than the current income level (Chyi and Huang, 1997). Another reason for rejection of the LC/PI hypothesis is due to myopia (Flavin, 1991). Olekalns (1997) describes individuals to be myopic if "they exhibit the traditional Keynesian response to income changes where the (non-zero) marginal propensity to consume is the same regardless of whether income is expected to increase or decrease".

From the above description of the LC/PI hypothesis we can now use such a model to see the implications for foreign aid inflows. In particular, it will enable an explicit test of the impact of foreign aid on consumption, whether foreign aid is used to smooth consumption or saved for investment purposes.

**8.4.2 Impact of foreign aid under the LC/PI hypothesis.**

We start by assuming that there is a representative consumer in each country which maximises utility, subject to his/her budget constraint. Using the simple model proposed by Campbell and Mankiw (1990) where

$$\Delta C_t = \alpha + \lambda \Delta Y_t^c + \varepsilon_t \quad (8.2)$$

we can now augment the income variable to include foreign capital inflows. This exercise has not until now been investigated using the LC/PI model. We redefine the expected level of income so that it includes not only domestic but also foreign sources of income such as foreign aid, private capital and other capital flows. In so doing we will be able to provide an explicit test of whether the representative individual consumes, in particular, current flows of foreign aid as proposed by aid critics. In this context the change in the expected level of income is redefined as:

$$\Delta Y_t^c = \Delta Y_t^{cd} + \Delta Y_t^{cf}$$

where  $\Delta Y_t^{cd}$  is the change in expected level of domestic income and  $\Delta Y_t^{cf}$  is the change in the expected level of income from foreign sources. We also define  $\Delta Y_t^{cf}$  to include the foreign income sources as:

$$\Delta Y_t^{cf} = \Delta A_t^c + \Delta P_t^c + \Delta OCF_t^c.$$

Where  $\Delta A_t^c$ ,  $\Delta P_t^c$  and  $\Delta OCF_t^c$  are the change in the expected levels of foreign aid, net private capital flows and other net capital flows respectively. Substituting  $\Delta Y_t^{cd}$  and the expression for  $\Delta Y_t^{cf}$  in  $\Delta Y_t^c$  above, we get:

$$\Delta Y_t^c = \Delta Y_t^{cd} + \Delta A_t^c + \Delta P_t^c + \Delta OCF_t^c.$$

Substituting the expression for  $\Delta Y_t^c$  in equation 8.2 and rewriting the consumption model for a panel data setting we get:

$$\Delta C_{it} = \alpha + \lambda_1 \Delta Y_{it}^{cd} + \lambda_2 \Delta A_{it}^c + \lambda_3 \Delta P_{it}^c + \lambda_4 \Delta OCF_{it}^c + \varepsilon_{it} \quad (8.3)$$

where  $i = 1 \dots N$  representing the countries. Under the LC/PI hypothesis  $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0$ . Also we can test  $\lambda_1 = 0$  and see whether expected changes in foreign incomes follow the LC/PI hypothesis, that is,  $\lambda_2 = \lambda_3 = \lambda_4 = 0$ . This can be done through an F-test. We can now proceed to test such a model.

**8.4.3 Data and Empirical Results.**

Since data are available for all the variables over the period 1970 to 1992 for most of the 68 countries in the sample<sup>4</sup>, we have used annual series to run the panel model. Due to some missing observations we use an unbalanced panel data set. The data are from the World Bank CD-ROM version (1995) and the Penn World Table (Mark 5.5). For the econometric technique our preference rests with the random effects model which uses feasible generalised least squares and is also more efficient than the least squares dummy variable technique. We can reasonably assume that the developing countries in the sample share the same set of institutional factors and characteristics. In addition such a technique will enable us to take time and/or country heterogeneity into consideration.

The model is re-specified so that the variables are expressed in per capita terms as:

$$\Delta c_{it} = \alpha + \lambda_1 \Delta y_{it}^c + \Delta \lambda_2 a_{it}^c + \lambda_3 \Delta p_{it}^c + \lambda_4 \Delta ocf_{it}^c + \varepsilon_{it} \quad (8.4)$$

where the lower case *c*, *y*, *a*, *p* and *ocf* represent equivalent upper case terms. Before testing the above model we first need to find instruments for the expected level of domestic and foreign incomes. For the expected change in the level of domestic income, the common practice of most studies has been to use lagged values of income per capita as instruments<sup>5</sup>. Flavin (1981) used lagged detrended values while Mankiw and Shapiro (1985) showed that this leads to statistical problems. Given this, we use the lagged values and also some other instruments as suggested by Runkle (1991) and used by Shea (1995) (these will be discussed as we proceed). Concerning the other variables we use lagged values as instruments. Hence we test the following model when  $y_{it-1}$  is used as an instrument for expected change in domestic income:

<sup>4</sup> A list of the countries can be found in Appendix I of Chapter 5.

<sup>5</sup> See Campbell and Mankiw (1990) for some caveats associated with such use.

$$\Delta c_{it} = \alpha + \lambda_1 y_{it-1} + \lambda_2 \Delta a_{it-1} + \lambda_3 \Delta p_{it-1} + \lambda_4 \Delta ocf_{it-1} + \varepsilon_{it} \quad (8.5)$$

To generate the feasible generalised least squares, the time variable (to compute the residual variance for period heterogeneity) is assigned a value of 1 to 4 to capture the main international events between the period 1972 to 1992 as described previously. That is, the years 1972 to 1975 take a value of 1, 1976 to 1981 a value of 2 (the oil price shock period), 1982 to 1987 a value of 3 (the debt crisis period) and 1988 to 1992 a value of 4 (the trade liberalisation period). When we use the time series 1972 to 1992 (assigning a value of 1 to 21) the results did not change.

Column 1 of Table 8.1 displays the results when the lagged change in income per capita ( $\Delta y_{it-1}$ ) is used as an instrument the expected changes in domestic income. The F-test,  $F_1$ , leads to the rejection of the LC/PI hypothesis<sup>6</sup> that  $\alpha = \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0$  also the individual t-test on  $\Delta y_{it-1}$ , but the F-test,  $F_2$ , which tests  $H_0: \lambda_2 = \lambda_3 = \lambda_4 = 0$  cannot be rejected and would suggest that expected changes in the level of foreign incomes do not affect permanent consumption decision, hence the LC/PI hypothesis cannot be rejected for this type of incomes. The result on the separate impact of domestic income is similar to the previously mentioned studies. In particular, consumption is found to be highly sensitive to current income. It seems that the representative agents reduce their per capita consumption level with increases in their current per capita domestic income level. When we compare the individual coefficients, *ceteris paribus*, we find that consumption is not sensitive to foreign aid flows which is contrary to the prediction of aid-sceptics (e.g. Griffin, 1970, Griffin and Enos, 1970, and Mosley, 1980) who argued that aid will be spent lavishly and used for consumption purposes. Concerning the other variables, they are not individually significant.

<sup>6</sup> Note that the F-test is based on the OLS  $R^2$  rather than the GLS  $R^2$ . The advantage of using the OLS  $R^2$  is that it is based on the original data. See Judge et al. (1985, pp. 31-32) for more details on this issue.

There have been many studies which have divided the time period 1972-92 into two decades: pre-1980 and post-1980 (e.g. Boone, 1994) to reflect the effects of the oil price shocks and stabilisation policies pursued in respective period. In column 2 we introduce a dummy variable, FACT, taking a value of 1 for the years 1981 to 1992 and zero otherwise. We also introduce some interaction terms to see whether the slope coefficients were different in the two time periods. To do so we multiply each explanatory variable by the dummy variable, FACT. We then run the following model:

$$\Delta c_{it} = \alpha + \lambda_1 \Delta y_{it-1} + \lambda_{11} \Delta y_{8192_{it-1}} + \lambda_2 \Delta a_{it-1} + \lambda_{21} \Delta a_{8192_{it-1}} + \lambda_3 \Delta p_{it-1} + \lambda_{31} \Delta p_{8192_{it-1}} + \lambda_4 \Delta oc_{it-1} + \lambda_{41} \Delta oc_{8192_{it-1}} + \lambda_5 \text{FACT} + \varepsilon_{it} \quad (8.6)$$

where  $y_{8192}$ ,  $a_{8192}$ ,  $p_{8192}$  and  $oc_{8192}$  are the interaction terms. The parameters  $\lambda_{11}$ ,  $\lambda_{21}$ ,  $\lambda_{31}$  and  $\lambda_{41}$  represent the differential slope coefficients while  $\lambda_5$  is the differential intercept between the two periods. Column 2 of Table 8.1 displays the parameter estimates of model 8.6. It can be seen from the F-test,  $F_1$ , the LC/PI hypothesis is rejected while the value of  $F_2$  suggests that the LC/PI hypothesis cannot be rejected for foreign incomes. We can derive for each period from column 2 as follows (Note: FACT = 1 for the second period):

*Pre-1980 Period<sup>7</sup>:*

$$\hat{\Delta c}_{it} = 6388700 - 352460^{***} \Delta y_{it-1} + 214450 \Delta a_{it-1} + 393930 \Delta p_{it-1} + 1233.1 \Delta oc_{it-1}$$

*Post-1980 Period:*

$$\hat{\Delta c}_{it} = -5972300 - 4400^{***} \Delta y_{it-1} + 414610 \Delta a_{it-1} - 17500 \Delta p_{it-1} - 1411.2 \Delta oc_{it-1}$$

Although in both time periods consumption is sensitive to expected changes in domestic income, the impact is quite different. While in the first period the agents myopically consume any expected increase in their current income, in

<sup>7</sup> Note '\*\*\*', '\*\*' and '\*' mean significant at 1%, 5% and 10% level respectively.

the second period they reduce their per capita consumption level. The foreign variables are not significant in either period while, *ceteris paribus*, we find that an expected increase in net private flows in the period 1972-80 would lead to an increase in real consumption per capita but lead to a fall in real consumption per capita for the period 1981-92. This result is not surprising given that during the oil price shocks private loans were 'cheap' and in abundance (see figure 1.1 in Chapter 1). Most of these funds have contributed to increases in domestic consumption while when they started to dry up and real interest rates were rising in the latter period, consumption eventually fell.

The consumption and domestic income variables in columns 1 and 2 were expressed in levels, while many studies have been using a log-linear approach which will also be followed here. Hence instead of using  $\Delta c_{it}$  ( $= c_{it} - c_{it-1}$ ) we use  $\Delta \log c_{it}$  which is  $\log c_{it} - \log c_{it-1}$ . This transformation has also the advantage in that it reflects the growth rate of the variable. The same technique is applied on all the other variables in the model. Because in our data set the foreign income variables have some negative values as they are expressed in *net* terms, we had no option but to use changes in their lagged levels. The model is hence re-specified as:

$$\Delta \log c_{it} = \alpha + \lambda_1 \Delta \log y_{it-1} + \lambda_2 \Delta a_{it-1} + \lambda_3 \Delta p_{it-1} + \lambda_4 \Delta ocf_{it-1} + \varepsilon_{it} \quad (8.7)$$

The parameter estimates of the above model are reported in column 3 of Table 8.1. Once again the LC/PI hypothesis is rejected based on the F-test,  $F_1$ . In particular, it can be seen that real consumption per capita growth is sensitive to expected changes in the growth rate of domestic income per capita. *Ceteris paribus*, a 1% increase in the growth rate of domestic income per capita leads to 0.07% increase in the growth rate of real consumption per capita. This is in conjunction with the findings of previous studies. The F-test,  $F_2$ , suggests that expected changes in foreign incomes do not affect permanent consumption decisions and the LC/PI hypothesis cannot be rejected for these types of income.

**Table 8.1: Generalised Least Squares Regression Results using panel data.**

Independent variables	Dependent Variable			
	$\Delta c_{it}$		$\Delta \log c_{it}$	
	Column 1	Column 2	Column 3	Column 4
Constant	7011700 (0.699)	3688700 (0.748)	0.27192 (0.261)	0.59353 (0.010)***
$\Delta y_{it-1}$	-87692 (0.004)***	-352460 (0.000)***	-	-
$\Delta y^{8/92}_{it-1}$	-	348060 (0.000)***	-	-
$\Delta \log y_{it-1}$	-	-	0.07025 (0.000)***	0.06181 (0.001)***
$\Delta a_{it-1}$	58908 (0.820)	214450 (0.654)	-0.0008 (0.846)	-0.0007 (0.859)
$\Delta a^{8/92}_{it-1}$	-	-200160 (0.727)	-	-
$\Delta p_{it-1}$	43811 (0.694)	393930 (0.054)*	-0.0022 (0.206)	-0.0022 (0.208)
$\Delta p^{8/92}_{it-1}$	-	-411430 (0.092)*	-	-
$\Delta o_{it-1}$	250.09 (0.969)	1233.1 (0.854)	-0.000012 (0.908)	-0.000011 (0.913)
$\Delta o^{8/92}_{it-1}$	-	-2644.3 (0.917)	-	-
PER2	-	-	-	0.0685 (0.786)
PER3	-	-	-	-0.7256 (0.009)***
PER4	-	-	-	-0.5212 (0.062)*
FACT	-	-12361000 (0.549)	-	-
OLS Adj.R <sup>2</sup>	0.00357	0.01858	0.02603	0.03111
GLS R <sup>2</sup>	0.00636	0.02439	0.02607	0.03579
F <sub>1</sub>	2.22*	3.86***	10.09***	7.24***
F <sub>2</sub>	0.086	0.535	0.545	0.554
N	1361			

Note: '\*\*\*', '\*\*' and '\*' mean significant at 1%, 5% and 10% level respectively. F<sub>1</sub> is an F-test testing the overall significance and F<sub>2</sub> tests whether the foreign income variables improve the fit, it is described in the text.



In column 4 we explicitly incorporated some time dummies to reflect the effects of the four main international events during the period 1972-92. The oil crisis period is represented by the dummy variable PER2 taking a value of 1 for the years 1976 to 1981 and zero otherwise, PER3 captures the debt crisis episodes of 1982 to 1987 taking a value of 1 for those years and zero otherwise while the trade liberalisation period is represented by the dummy variable PER4, taking a value of 1 for the years 1988 to 1992 and zero otherwise. Note that the constant then represents the period 1972 to 1975. Although there are no major changes in parameter values, they are similar to those in column 3. The same deductions can be made about the LC/PI hypothesis. The time dummies tell us that the post 1980 period is significantly different from the pre-1980 period. Notice that during the period 1972-75 real per capita consumption growth was higher than any other periods. As discussed earlier, during the debt crisis real consumption growth (especially government consumption) fell dramatically mainly because of the limited supply of external capital, sharp rise in real interest rates and stabilisation policies which were in force. For the period 1987-92, although foreign capital supply resumed, consumption growth was still lower than pre-1980 period. This could be accounted for by the effect of stabilisation policies with effective policy dialogue and a better consciousness for saving. A Wald test revealed that the parameter values of PER3 and PER4 were equal.

Ignoring the results when using changes in levels (columns 1 and 2), we have not so far found that an expected change in foreign aid affects (especially to increase) the growth of consumption per capita as argued by aid sceptics. This could be, first, because we have not taken the time dimension explicitly in the model by introducing interaction terms in light of the above findings. Second, it might be that the LC/PI hypothesis holds only with this form of income. Third, it could be because the consumption variable includes public and private consumption while it is the public sector which receives such flows. Private individuals cannot directly make consumption decisions on such flows.

Disaggregating the consumption data might shed some light on this issue. Fourth, foreign aid inflows have been closely monitored by donors so as to be certain that they are being used properly. Donors monitor the way foreign aid is being used by either attaching some conditionality or by tying the aid. Stokke (1995) defines aid conditionality as “the use of pressure, by the donor, in terms of threatening to terminate aid, or actually terminating or reducing it, if conditions are not met by the recipient” (pp. 12). Stokke states that there has been two generations of conditionality. The first generation conditionality is related to the structural adjustment programmes and stabilisation policies under the auspices of International Monetary Fund and World Bank in the early 1980s aimed at reform of the economic policy of the recipient country which came in the wake of the growing economic crisis of many developing countries. On the other hand, the second generation conditionality was triggered by the systemic transformation of the Soviet bloc and its core power, the USSR. Second generation conditionality has been aimed at political reform involving both systematic and substantive aspects. Its objectives have been “to promote democratic reform, human rights and administrative accountability in the South” (Ibid. pp. 1). Stabilisation policies had some impact on public sector consumption making recipients aware of the problems entailed in spending aid funds lavishly (for e.g. the ‘Dutch-Disease’ effect). It can reasonably be assumed that recipients have/are learning from their past mistakes in managing foreign aid funds.

We start first by including the interaction terms on each explanatory variable as discussed earlier to account for the pre- and post-1980 periods. We hence estimate the following model:

$$\Delta \log c_{it} = \alpha + \lambda_1 \Delta \log y_{it-1} + \lambda_{11} \Delta \log y8/92_{it-1} + \lambda_2 \Delta a_{it-1} + \lambda_{21} \Delta a8/92_{it-1} + \lambda_3 \Delta p_{it-1} + \lambda_{31} \Delta p8/92_{it-1} + \lambda_4 \Delta oc f_{it-1} + \lambda_{41} \Delta oc f8/92_{it-1} + \lambda_5 FACT + \varepsilon_{it} \quad (8.8)$$

The estimated feasible generalised least squares estimates of the above model are presented in column 1 of Table 8.2. Interestingly this time both F-tests

reject the LC/PI hypothesis. The dummy variable FACT is in line with our expectation that the 'policies' did have an impact in reducing real consumption in the post 1980 period and *ceteris paribus*, it suggests that consumption growth was 0.78% lower in the post 1980 period. We can also derive separate regressions for each period as follows:

*Pre-1980 Period:*

$$\Delta \log \hat{c}_{it} = 0.67669*** + 0.0754***\Delta \log y_{it-1} + 0.01425*\Delta a_{it-1} - 0.0004\Delta p_{it-1} - 0.00005\Delta oc_{it-1}$$

*Post-1980 Period:*

$$\Delta \log \hat{c}_{it} = -0.10289*** + 0.0754***\Delta \log y_{it-1} - 0.18995*\Delta a_{it-1} - 0.00327\Delta p_{it-1} + 0.00083**\Delta oc_{it-1}$$

Comparing the above two regressions we can see that in both cases the LC/PI hypothesis is rejected. Although individually effect of the expected change in per capita domestic income is the same in both periods, the impact of an expected change in aid per capita is quite different. In fact, *ceteris paribus*, for the pre-1980 period a \$1 expected increase in aid per capita increases consumption growth by 0.014%, while a similar amount reduces consumption growth by 0.19% in the post-1980 period. This implies that more resources were saved in the latter period while in the former period there is a strong case for the fungibility issue supporting Griffin's argument. As Mosley and Hudson (1995) argued, effective policy dialogue during the 1980s could have led to the decline in the fungibility of aid in developing countries. A significant outcome from the derived regressions suggests that consumption per capita in the post 1980 period has been crowded out due to expected increases in foreign aid. This is plausible in cases where the donor imposes some fund-matching by the recipient before disbursing any aid. In such a case the recipient is forced to postpone its consumption to satisfy such requirements.

Interestingly the individual impact of other capital flows has a significant, although minor, positive effect on consumption growth. On the other hand, the

individual impact of net private flows supports the LC/PI hypothesis. It would seem that these flows are directed for investment purposes rather than consumption.

**Table 8.2: Generalised Least Squares Regression Results using panel data.**

**Dependent Variable:  $\Delta \log c_{it}$**

Independent variables	Column 1	Column 2	Column 3	Column 4
Constant	0.67669 (0.000)***	-1.1047 (0.255)	1.1388 (0.323)	1.0865 (0.000)***
$\Delta \log y_{it-1}$	0.07540 (0.007)***	-	-	-
$\Delta \log y_{8192_{it-1}}$	-0.02540 (0.482)	-	-	-
$\log y_{it-1}$	-	0.06994 (0.800)	-	-
$\log c_{it-1}$	-	-	-0.02880 (0.936)	-
$\Delta \log c_{it-1}$	-	-	-	-0.03756 (0.159)
$\Delta a_{it-1}$	0.01425 (0.060)*	0.01428 (0.058)*	0.01428 (0.050)**	0.01458 (0.055)*
$\Delta a_{8192_{it-1}}$	-0.02042 (0.025)**	-0.01963 (0.029)**	-0.01965 (0.025)**	-0.01993 (0.028)**
$\Delta p_{it-1}$	-0.0004 (0.887)	0.00099 (0.747)	0.00102 (0.735)	0.00108 (0.727)
$\Delta p_{8192_{it-1}}$	-0.00287 (0.451)	-0.00394 (0.292)	-0.00397 (0.274)	-0.00367 (0.329)
$\Delta o_{it-1}$	-0.00005 (0.631)	-0.000044 (0.681)	-0.000044 (0.669)	-0.00004 (0.707)
$\Delta o_{8192_{it-1}}$	0.00083 (0.039)**	0.00088 (0.028)**	0.00088 (0.024)**	0.0009 (0.025)**
FACT	-0.77958 (0.004)***	-1.1047 (0.000)***	-1.0989 (0.000)***	-1.1329 (0.000)***
OLS Adj. $R^2$	0.04271	0.03255	0.03282	0.03114
GLS $R^2$	0.04858	0.03732	0.03649	0.03564
$F_1$	7.74***	6.72***	6.77***	6.46***
$F_2$	2.15**	2.08*	2.10**	2.15**
N	1361			

Details as in Table 8.1.

Concerning the limitations of the use of a lagged variable as instruments, we use those as suggested by Runkle (1991) for the expected changes in domestic income. As for the other explanatory variables we continue to use the same instruments. In column 2 we use the log of real income per capita at  $t-1$  ( $\log y_{it-1}$ ) as an instrument for the expected changes in domestic income and log real consumption at  $t-1$  ( $\log c_{it-1}$ ) in column 3 (Table 8.2). Olekalns (1997) has also used the lagged dependent variable ( $\Delta \log c_{it-1}$ ) as an instrument, we report this result in column 4 of Table 8.2.

Interestingly the LC/PI hypothesis cannot be rejected individually on any of Runkle's and Olekalns' instruments. Shea (1995) also obtained similar results when Runkle's instruments were used. In all these three cases some robust results are obtained supporting the findings in column 1 of Table 8.2 concerning the foreign aid variables (see the F-test,  $F_2$ , and the individual t-tests). The results suggest that the fungibility of aid has declined in the post-1980 period.

Since the foreign aid variable is of particular interest to our analysis we now proceed to test how our representative consumer in the aid receiving country will react to changes in anticipated and unanticipated aid inflows. According to the LC/PI hypothesis any anticipated inflows will already be incorporated in present consumption and only unexpected changes (i.e. unanticipated flows) will affect consumption (refer to the previous quote of Hall, 1978). In relation to this we use a simple expectation hypothesis model to obtain information regarding changes in anticipated and unanticipated foreign aid inflows. We first derive the expected trend in foreign aid for each individual country in the sample by regressing foreign aid per capita (AIDP) on time to obtain the residuals for the years 1970 to 1992. Since the residuals are deviations from the trend, they can be regarded as unanticipated flows. To undertake this exercise we had to create 68 files as there are 68 countries in the sample. We proceed to estimate the following model for each of the 68 countries in the sample:

$$AIDP = \alpha_0 + \alpha_1 \text{Time} + \varepsilon_t \quad (8.9)$$

We denote the fitted trend values, that is the anticipated aid flows as FIT and the unanticipated flows as RES. We need to be careful about the residual values which may suffer from some noise in the data while estimating the ‘trend’ values. From these obtained values we then take changes of the respective variable and lag them to be used as instruments for the expected change in foreign aid. We first estimate the following model using the lagged changes of the residuals ( $\Delta RES_{it-1}$ ) as instruments for the expected change in foreign aid per capita (we also introduce its respective interaction term,  $\Delta RES8192_{it-1}$ ):

$$\Delta \log c_{it} = \alpha + \lambda_1 \Delta \log y_{it-1} + \lambda_{11} \Delta \log y8192_{it-1} + \lambda_2 RES_{it-1} + \lambda_{21} \Delta RES8192_{it-1} + \lambda_3 \Delta p_{it-1} + \lambda_{31} \Delta p8192_{it-1} + \lambda_4 \Delta oc f_{it-1} + \lambda_{41} \Delta oc f8192_{it-1} + \lambda_5 FACT + \varepsilon_{it} \quad (8.10)$$

The estimates of the above model are given in column 1 of Table 8.3. Once again the significant individual effect of the growth of per capita domestic income leads to the rejection of the LC/PI hypothesis. Notice that the collective impact of foreign income, as shown by the  $F_2$  value of 1.54, is in support of the LC/PI hypothesis. To see what is the response of the representative agents in relation to an expected change in the level of anticipated aid flows, we add the lagged changes of the fitted aid per capita,  $\Delta FIT_{it-1}$ , and its respective interaction term,  $\Delta FIT8192_{it-1}$ . The results are reported in column 2 of Table 8.3. Here also the LC/PI hypothesis is rejected. The individual coefficient of  $\Delta FIT_{it-1}$  suggests that during the period 1972-92 increases in expected aid flows reduce real consumption growth. This is contrary to the prediction of the LC/PI hypothesis. It seems that recipients in the sample not only abstain from consuming anticipated aid flows, but also reduce consumption levels in the event of an expected increase in these flows. This could be the effect of first and second generation conditionality along with donors’ use of tied aid or the recipients are undertaking some projects or programmes which might require fund-matching from their own domestic resources. The latter can be a potential reason for such a result. As we pointed out earlier, the consumption variable includes private and public consumption on goods and services. The main

recipient of aid flows is the government which actually manages such funds. Well before an amount of aid is disbursed, government officials have to undertake some “marketing” to obtain the funds from international organisations in order to finance some projects. There are a number of reasons why the government might reduce its consumption level in association with an increase in the expected foreign aid level. For instance,

- (a) There might be some urgency in undertaking certain projects which have to be carried out. Knowing that foreign aid is expected to increase, the projects could be undertaken without delay, with the government reducing its present level of consumption.
- (b) The expected increase in foreign aid may be attached to some conditions where the recipient has to supply additional funds from their own domestic resources. In such a case if the government foresees this, then cuts in the current level of consumption might be a plausible option to provide matching funds.

To see whether public or private consumption is affected by anticipated aid flows we run two separate regressions. In Table 8.3, column 3 has as the dependent variable the change of log public consumption per capita ( $\Delta \log gc_{it}$ ) while column 4 has the change of log private consumption per capita ( $\Delta \log pc_{it}$ ). The results when the interaction terms were included are not reported as none were significant. The results still remain the same. When growth of real government consumption per capita is the dependent variable, individually the growth of domestic income per capita is significantly different from zero which ultimately rejects the LC/PI hypothesis. Although the collective impact of foreign income cannot reject the LC/PI hypothesis, it can be seen that individually an increase in anticipated foreign aid flows reduces government consumption growth but not when the dependent variable is the growth of private consumption per capita. Notice that when the dependent variable is the growth of private consumption per capita the LC/PI hypothesis cannot be rejected.

**Table 8.3: Generalised Least Squares Regression Results using panel data.**

Independent variables	Dependent Variables:			
	$\Delta \log c_{it}$		$\Delta \log gc_{it}$	$\Delta \log pc_{it}$
	Column 1	Column 2	Column 3	Column 4
Constant	0.70321 (0.003)***	0.9931 (0.000)***	0.75163 (0.021)**	1.227 (0.006)***
$\Delta \log y_{it-1}$	0.07924 (0.005)***	0.06936 (0.014)**	0.16493 (0.000)***	0.02341 (0.310)
$\Delta \log y_{8192_{it-1}}$	-0.02943 (0.421)	-0.02018 (0.582)	-	-
$\Delta Fit_{it-1}$	-	-1.1130 (0.000)***	-0.68201 (0.056)*	-0.7884 (0.167)
$\Delta Fit_{8192_{it-1}}$	-	0.43112 (0.286)	-	-
$\Delta Res_{it-1}$	0.0545 (0.216)	0.0508 (0.249)	0.0222 (0.641)	0.01661 (0.634)
$\Delta Res_{8192_{it-1}}$	-0.0371 (0.517)	-0.03403 (0.552)	-	-
$\Delta p_{it-1}$	-0.00048 (0.879)	-0.00076 (0.812)	-0.00020 (0.946)	-0.00269 (0.219)
$\Delta p_{8192_{it-1}}$	-0.00289 (0.447)	-0.00248 (0.514)	-	-
$\Delta o_{it-1}$	-0.000056 (0.600)	-0.000055 (0.610)	0.000079 (0.655)	-0.00025 (0.848)
$\Delta o_{8192_{it-1}}$	0.00089 (0.028)**	0.00088 (0.029)**	-	-
FACT	-0.8224 (0.003)***	-0.9541 (0.001)***	-0.7516 (0.056)*	-1.3360 (0.001)***
OLS Adj. $R^2$	0.04013	0.05304	0.04587	0.02736
GLS $R^2$	0.04593	0.06052	0.04506	0.02908
$F_1$	7.32***	7.93***	10.65***	7.38***
$F_2$	1.54	3.73***	1.12	0.688
N	1361			

Details as in Table 8.1.

All the results which have been reported need to be cautiously interpreted as it is implicitly assumed that the real rate of interest is constant over the period. Any rejection of the theory might be attributable to the failure of this assumption. During the period 1970-92 it can hardly be assumed that real interest rates were constant. In fact during the debt crisis period, developing countries were facing high real interest rates on previously contracted loans



during the 1970s. Given such variations over the period it seems desirable to control for expected changes in the real interest rate when testing the LC/PI hypothesis. Unfortunately given the lack of time series data for all the 68 countries it was not possible to carry out this investigation. This can be analysed in the future for countries where data are available.

#### **8.4.4 Conclusion**

The analysis using the LC/PI hypothesis has been very useful in deriving some implications for foreign aid inflows and it has made interpretations easier. Overall our results lead to the rejection of the LC/PI hypothesis which other studies have also found. In the beginning it was observed that real per capita consumption growth was sensitive only to changes in expected domestic income per capita which led to the rejection of the LC/PI hypothesis individually. On the other hand, expected changes in foreign incomes were collectively in support of the LC/PI hypothesis. But once the post-1980 period was considered through the introduction of interaction terms, the LC/PI hypothesis was rejected. Among the foreign incomes, consumption was found to be sensitive to foreign aid in particular. Although one could not reject the fungibility hypothesis during the period 1972-80, it was found that in the post-1980 period increases in expected foreign aid flows was in fact significantly crowding out consumption. This could be the effects of the 'policy improving factors', such as the first and second generation conditionality under the auspices of the International Monetary Fund and the World Bank, donors' interest in managing and controlling aid funds, fund matching projects or programmes and also recipients' awareness and lessons from past mistakes.

Another important result was that increases in expected anticipated aid flows have led to a reduction in consumption levels, in particular government consumption. This is not surprising as it is the governments of developing countries which receive these funds. Expected changes in either domestic or

foreign incomes did not have any impact on private consumption decisions. In this case the LC/PI hypothesis could not be rejected.

The impact of foreign aid on consumption through the LC/PI model is quite robust, it does affect consumption decisions. It has been found that increases in foreign aid increased the consumption level during the period 1972-80 while effective policy dialogue and other factors in the 1980s have enabled a decline in consumption, and encouraged more savings. The question is whether foreign aid flows not consumed are efficiently invested. This drives us to the next section to test empirically the aid-investment nexus.

## **8.5 Foreign Aid and Investment.**

### **8.5.1 Model Specification**

Surprisingly as it may be, there are not many empirical studies assessing the impact of foreign aid on investment. The very few studies which have been undertaken have mostly concluded that the relationship between foreign aid and investment is positive. Levy (1988) found that between the period 1968 to 1982 an additional 'dollar' of foreign aid would raise domestic investment by 1.08 dollars on a sample of 22 Sub-Saharan African countries. Mosley and Hudson (1995) found, using single country time series data (1963-90), that in 5 out of the 14 countries in their sample (Bangladesh, Sri Lanka, Nepal, Tanzania and Gambia) the foreign aid variable was positive and significantly different from zero. In none of the other remaining countries was foreign aid found to reduce domestic investment.

Using panel data based on ten year averages, Boone (1994) did not find any impact of aid on investment, using instrumental variable techniques. Note that his analysis has some drawbacks, for example, the investment and aid variables were expressed as ratios of GNP rather than GDP (see Newlyn (1991) for the shortcoming of such use) and the investment regression model does not have

any theoretical underpinning. Hadjimichael *et al.* (1995), on the other hand, have assessed the impact of aid on private investment rather than on aggregate domestic investment. They reported some mixed results for countries in the Sub-Saharan Africa. While the impact of aid has been positive for the group of sustained adjusters, in countries with negative per capita growth performance foreign aid appeared to have discouraged private investment.

It is not difficult to see why there have been only a few studies investigating in this area. First, the determinants of investment have been subject to debate, for example, political factors, the level of risks, etc.. Also the data on these factors are not always available<sup>8</sup>. Another factor is whether we should investigate using aggregate investment data or by decomposing investment into public and private. In fact limited data series seriously prevents examination of such relationships. Although we have a large number of observations, which is an improvement over previous studies, we are still constrained to use aggregate investment. Had the data been available, we could test whether foreign aid crowds in/out public and/or private investment, or whether publicly aid-financed projects crowds in/out private investment.

Before testing the aid-investment relationship, we start by using a theoretical model. Theoretical models of investment suggest several determinants of investment behaviour. At the aggregate level, the early accelerator theory of investment captured the dependence of investment on expected returns. According to the accelerator model, investment is related linearly to changes in output. We can write the investment function as:

$$INV = f(\Delta Y)$$

or

$$\frac{INV}{Y} = f\left(\frac{\Delta Y}{Y}\right)$$

For estimation purposes in a panel setting, the following model can be used:

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<sup>8</sup> For some data on these see Barro and Lee (1994) but they mostly use dummy variables.

$$I_{it} = \gamma_1 + \beta \text{GROWTH}_{it} + \varepsilon_{it}$$

where  $I_{it}$  is the investment rate and GROWTH is the growth rate of GDP. The above model can be augmented to include the various sources of foreign savings (foreign aid, private capital flows and other capital flows) and domestic savings. When estimating the simple accelerator model, many have used lagged output growth rather than current growth. This is because investment decisions take some time to be executed and are based on lagged information about output changes. Lagged output growth also captures the macroeconomic environment which affects investment decisions. Also in a panel setting, this variable might lead to some indication of whether developing countries are technologically catching-up. This will be observed if the coefficient on lagged output growth is negative and significant. We hence test the following model:

$$I_{it} = \gamma_1 + \beta_1 \text{OECD}_{it} + \beta_2 \text{PRIV}_{it} + \beta_3 \text{OTHERIFS}_{it} + \beta_4 \text{SAV}_{it} + \beta_5 \text{GROWTH}_{it-1} + \varepsilon_{it}$$

where OECD is foreign aid as a percentage of GDP, PRIV is net private capital flows as a percentage of GDP, OTHERIFS is other capital flows as a percentage of GDP and SAV is domestic savings as a percentage of GDP.

### **8.5.2 Empirical Results**

The parameters of the above model are given in column 1 of Table 8.4. All the variables are individually significantly different from zero. It can be noticed that the impact of foreign aid on investment is positive and highly significant. In fact, *ceteris paribus*, a 1% increase in foreign aid raises the investment rate by 0.28%. Individually, net private capital flows have a much higher impact than other sources of savings. Notice also that the other capital flows variable is also positive and significant. The lagged growth variable is positive and significant which might suggest that the accelerator effect is stronger than the technological catching-up effect.

**Table 8.4: Generalised Least Squares Regression Results using panel data.****Dependent Variable: Investment Rate.**

Independent variables	Column 1	Column 2	Column 3	Column 4
Constant	10.164 (0.000)***	6.3718 (0.000)***	4.6858 (0.000)***	6.3208 (0.000)***
OECD	0.27927 (0.000)***	0.28073 (0.000)***	0.27743 (0.000)***	0.27847 (0.000)***
PRIV	0.48716 (0.000)***	0.44508 (0.000)***	0.44674 (0.000)***	0.44748 (0.000)***
OTHERIFS	0.00605 (0.000)***	0.00537 (0.001)***	0.00532 (0.002)***	0.0056 (0.002)***
SAV	0.45252 (0.000)***	0.43068 (0.000)***	0.44033 (0.000)	0.43177 (0.000)***
GROWTH <sub>t-1</sub>	0.19456 (0.000)	0.19504 (0.000)***	0.1950 (0.000)***	0.19554 (0.000)***
INF	-	0.000003 (0.991)	-	-
OPEN	-	0.04219 (0.000)***	0.0421 (0.000)***	0.0414 (0.000)***
MONEY	-	0.06601 (0.000)***	0.02224 (0.000)***	0.06642 (0.000)***
CINVY	-	-0.00077 (0.692)	-	-
CINVC	-	-	0.01319 (0.312)	-
FACT	-	-	-	-0.0935 (0.860)
OLS Adj.R <sup>2</sup>	0.59339	0.62292	0.62068	0.63129
GLS R <sup>2</sup>	0.58680	0.59909	0.59669	0.59958
F	397.94***	250.63***	279.18***	292.07***
N	1361			

Details as in Table 8.1.

In column 2, we augmented the model to include some policy variables such as the inflation rate (INF) to control for macroeconomic instability, the openness measure (OPEN), the financial liberalisation variable (MONEY) and the cost of investment (CINVY). When these variables were added, the estimates on foreign aid, net private capital, other capital flows, domestic savings rate and lagged growth remained similar. Individually, the inflation rate was not significant. This is not surprising due to the presence of the growth variable

which was picking up the effect of macroeconomic stability. Dropping the growth variable made the inflation rate significant, but we have preferred to instead keep the growth variable due to the theoretical relation with the investment rate. For the trade variable, we used the crude openness measure—export plus imports as a percentage of GDP (OPEN). This is because the volume of trade indicates the level of trading activities as private investors, in particular, are usually engaged in export and/or import activities. The parameter estimate of the openness measure (OPEN) is seen to be positive and significantly related to the investment rate. The coefficient of the financial variable, MONEY, suggests that financial liberalisation encourages domestic investment, the estimate being positive and significant. Concerning the cost of investment variable, CINVY, which is calculated as the price of investment as a percentage of the price of GDP<sup>9</sup> is not significant. Even when the cost of investment was recalculated as the price of investment relative to the price of consumption, CINVC, this variable still remained insignificant (column 3). The other variables maintained their overall impact and significance.

In column 4 we dropped variables which were found to be insignificant and we added the dummy variable FACT as described earlier to account for the ‘aid improving factors’. In essence, it would also tell us whether the investment rate in the period 1972-80 was different from the period 1981-92. We can see that in column 4 this dummy variable is not significant which implies that, *ceteris paribus*, the investment rate in these two time periods was not different. When we investigated the aid-consumption relationship we found that consumption per capita dropped in the latter period. In particular it was found that increases in anticipated foreign aid reduced government consumption per capita. One of the reasons for such reduction in government consumption is due to the first generation conditionality which was initiated by the International Monetary Fund and World Bank. It is argued that stabilisation policies have improved the macroeconomic environment and that international aid donors’ effort to

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<sup>9</sup> The data to compute the cost of investment were obtained from the Penn World Tables.

monitor and manage foreign aid (for e.g. tied aid) have reduced fungibility of aid. But do these policies and aid monitoring increase the effectiveness of aid on investment? Or, if the recipients are forced not to spend part of the aid flows on consumption, does this mean that diverting these aid flows into investment activities are necessarily productive? It is well known that in the presence of conditionality and strings attached to foreign aid the recipients cannot attain the optimal point on their indifference curve, hence they cannot maximise their utility unless the aid-monitoring agencies have perfect information (see Pack and Pack, 1993). In such a case 'forced' investment might not always be appropriate.

To test these effects (whether the effectiveness of foreign aid has improved under these conditions since the 1980s), we make use of an interaction term on the foreign aid variable<sup>10</sup>. The interaction term is denoted and defined as:

$$\text{OECDFACT} = \text{OECD} \times \text{FACT}$$

The model then becomes:

$$I_{it} = \gamma_1 + \beta_1 \text{OECD}_{it} + \beta_{12} \text{OECDFACT}_{it} + \beta_2 \text{PRIV}_{it} + \beta_3 \text{OTHERIFS}_{it} + \beta_4 \text{SAV}_{it} + \beta_5 \text{GROWTH}_{it-1} + \beta_6 \text{FACT}_{it} + \text{other variables} + \varepsilon_{it}$$

so that for the effectiveness of foreign aid for the period 1972-80 is given by:

$$E(I_{it} / \text{FACT} = 0, \text{OECD}_{it}) = \gamma_1 + \beta_1 \text{OECD}_{it}$$

and for the period 1981-92 as:

$$E(I_{it} / \text{FACT} = 1, \text{OECD}_{it}) = (\gamma_1 + \beta_6) + (\beta_1 + \beta_{12}) \text{OECD}_{it}$$

The parameter estimates of the above model is given in column 1 of Table 8.5. Individually, all the previously included variables are significant, except the dummy variable FACT. Focusing on the foreign aid variable we find that the effectiveness of foreign aid in the period 1981-92 is lower than in the period 1972-80. In fact,  $\beta_{12}$  represents the differential slope coefficient between the two periods. The effectiveness of aid on investment (excluding the intercept term) for the period 1981-92 is equal to 0.25745 (0.36565 - 0.1082)<sup>11</sup>, while

<sup>10</sup> See Gujarati (1995, pp. 512) for such a technique.

<sup>11</sup> We also used foreign aid lagged by one period along with its respective interaction term and we found a similar result, a value of 0.21542.

for the period 1972-80 it is 0.36565. Although the impact of foreign aid on investment still is positive and significant in the later period, its effectiveness or productivity has fallen. There might be many reasons to explain such crowding out or reduced effectiveness especially since the 1980s. First, it is well known that the positive impact of foreign aid may be dampened by the conditionalities imposed by donors, particularly in bilateral cases. This might suggest that the productivity of foreign aid is lessened when strings are attached. Also it indicates the potential distortionary effects of tied aid as found by Yeats (1990) in the case of former colonies. Second, foreign aid may be crowding out private investment. Government capital expenditure is substantially financed by aid. In the process, resources are withdrawn from other sectors (mainly from the private sector) which may lead to crowding out. But in the long run crowding in may well result. This would require further investigation, by disaggregating investment into public and private components. Thirdly, investment undertaken during the 1980s may have long run social returns and benefits which are not being captured in our model.

There is also debate about the effectiveness of the macro-policy adjustment package introduced by the IMF and World Bank. Some analyses of the effects of structural adjustment lending have shown relatively disappointing results. Mosley (1994, pp. 7) argues that although overall performance of the 'adjustment lending' countries was better than 'non-adjusting' countries, the investment rate was disappointing. Elbadawi (1992, pp. 5) also concludes that in Sub-Saharan Africa, "World Bank adjustment lending.....has contributed to a statistically significant drop in the investment ratio". Note that since in our sample we have a significant number of Sub-Saharan African countries which undertook structural adjustment, this might be driving our results on the effectiveness of foreign aid on investment.

Many authors have questioned the exogeneity of using current values of foreign aid and other forms of capital inflows as explanatory variables. To



address this issue of any potential endogeneity problems we lagged these variables by one period. The estimates of these parameters are reported in column 2 of Table 8.5. OECDLAG is foreign aid lagged by one period, PRIVLAG is net private capital flows lagged by one period and OTHERLAG is other capital flows lagged by one period. We can see that even when using the lagged variables, the same conclusions can be drawn, except for the individual coefficient of lagged 'other capital inflows', OTHERLAG.

In column 3 we included both the current and lagged variables. It can be observed that, *ceteris paribus*, the lagged variables have a lesser impact on investment than the current variables. The other variables continue to be individually significant and positive as before.

Finally, we run a quadratic model on the foreign aid variable as used by Hadjimichael *et al.* (1995). Note that their dependent variable was private investment and their explanatory variables are different than those used here. Column 4 in Table 8.5 reports the estimates of the model and OECDSQ is the square of the foreign aid variable, OECD. The parameter estimate on the OECDSQ is not significant, rejecting the non-linearity relationship between foreign aid and investment which Hadjimichael *et al.* found. Other variables did not change much.

**Table 8.5: Generalised Least Squares Regression Results using panel data.****Dependent Variable: Investment Rate.**

Independent variables	Column 1	Column 2	Column 3	Column 4
Constant	5.8658 (0.000)***	6.8740 (0.000)***	5.994 (0.000)***	6.2171 (0.000)***
OECD	0.36565 (0.000)***	-	0.22597 (0.000)***	0.2776 (0.000)***
OECDFACT	-0.10820 (0.001)***	-	-	-
OECDLAG	-	0.23052 (0.000)***	0.0820 (0.037)**	-
OECD SQ	-	-	-	0.0075 (0.961)
PRIV	0.45094 (0.000)***	-	0.38766 (0.000)***	0.44527 (0.000)***
PRIVLAG	-	0.29735 (0.000)***	0.12353 (0.000)***	-
OTHERIFS	0.00534 (0.002)***	-	0.00474 (0.007)***	0.00535 (0.002)***
OTHERLAG	-	-0.00243 (0.134)	-0.0013 (0.418)	-
SAV	0.43637 (0.000)***	0.40966 (0.000)***	0.43022 (0.000)***	0.43169 (0.000)***
GROWTH <sub>t-1</sub>	0.19744 (0.000)***	0.20459 (0.000)***	0.18523 (0.000)***	0.19530 (0.000)***
OPEN	0.03994 (0.000)***	0.04699 (0.000)***	0.0404 (0.000)***	0.04169 (0.000)***
MONEY	0.06428 (0.000)***	0.07024 (0.000)***	0.0671 (0.000)***	0.06641 (0.000)***
FACT	0.5368 (0.344)	-	-	-
OLS Adj.R <sup>2</sup>	0.63833	0.59205	0.62347	0.62054
GLS R <sup>2</sup>	0.60671	0.56828	0.59953	0.59768
F	267.70***	282.97***	226.19***	279.01***
N	1361			

Details as in Table 8.1

### **8.5.3 Conclusion**

Overall we have found a robust positive and significant impact of foreign aid on investment for the period 1972-92. Although we noticed reduced aid effectiveness on investment during the period 1981-92 by 0.11% compared to the period 1972-80, its impact is still positive. Some of the reasons which might have led to such a fall in effectiveness are tied aid, too much aid-monitoring and possibly unsound stabilisation policies which did not suit the developing countries and conditionality attached. For foreign aid to be effective, there should be an effective policy dialogue which suits the recipient environment and situation, and also meets donors' requirements.

### **8.6 Concluding Remarks**

It has been observed earlier that countries with high savings rates have performed quite well in the sense that their investment rates and growth have been high. Foreign aid has been criticised to have reduced domestic savings (e.g. Griffin, 1970). It has been claimed that aid leaks into consumption rather than investment, although this was not clear in the statistical exercise performed in Chapter 5. The empirical studies testing the aid-savings relationship have been subject to many criticisms concerning sample size, estimation techniques, omitted variables, data measurement error, etc.. In regard to omitted variables and data measurement problems entailed in obtaining savings data, we have tested the aid-savings relationship through the life-cycle/permanent income hypothesis.

The life-cycle/permanent income model that we have specified has enabled an explicit test of the fungibility issue and has implicitly taken care of omitted variables. Using log transformation on key variables, it was found that the life-cycle/permanent income hypothesis could not be accepted as found by previous studies testing this hypothesis. Current domestic income is found to be highly

sensitive with current consumption. Since it was found that the pre-1980 period was significantly different from the post-1980 period, we made use of interaction terms on all the explanatory variables to assess their impact in the two time periods. Interestingly, it was found that foreign aid in the pre-1980 period was leaking into consumption (i.e. reducing domestic savings) while in the post-1980 period, it was reducing the consumption level (i.e. increasing domestic savings). The latter could be explained through the effects of the first and second generation conditionality imposed by the International Monetary Fund and the World Bank, donors' interest in monitoring aid funds and so on. These findings show that there has been a decline in the fungibility of aid in developing countries.

Concerning the effectiveness of aid on investment, it is found to have positive and significant impact. *Ceteris paribus*, private capital flows have relatively higher impact than foreign aid. This is not surprising given the nature of these flows. When we assessed the effectiveness of aid on investment for the pre- and post-1980 periods, we found that aid was more effective in the pre-1980 period than the post-1980 period. This could be explained by the fact that during the 1970s abundant private capital flows have helped to improve aid's effectiveness while with the debt crisis in the early 1980s its effectiveness fell. Also the decline in aid's effectiveness might suggest that 'forced' investment by donors is not always beneficial. But overall, the effectiveness of aid on investment is still positive.

# Chapter Nine

## Summary and Future Research Suggestions

# **Chapter Nine**

## **SUMMARY AND FUTURE RESEARCH SUGGESTIONS**

### **9.1 Introduction**

After a generation of foreign aid transfers, donor agencies, the public in donor countries, politicians and aid lobbyists have become weary about its achievements. The only way to ascertain the contribution of foreign aid is through systematic evaluation. As Cassen *et al.* (1986) put it, “knowledge about the effectiveness of aid is needed both to make judgements about its worthiness and to improve its management” (pp. 294). Whether aid is effective or not is purely empirical. The present study has embarked on an empirical investigation between the relationships of aid and growth, aid and savings, and aid and investment. Overall, we have found that the effectiveness of aid on growth, savings (implicitly) and investment is positive. This supports the positive contribution of aid found earlier from micro level evaluations, see Cassen *et al.* (1986). The positive contribution of aid was also acknowledged much earlier, for example, by a former director of the DAC of the OECD in 1982 who stated that:

“very heavy concentrations of economic aid have helped lay the base for burgeoning economic expansion. There also has been a good deal of progress- failures as well, but mainly significant, ramifying successes- in helping build such key development- promoting institutions as agricultural universities, technical institutes and enterprise management training establishments in many countries. Directly and indirectly, aid has contributed to the downward trend in birth rates that begun to appear in certain countries,...without aid...Third World growth.....would have been slower, the

outcomes for the poor would have been worse, social and political turbulence would have been greater and less groundwork would have been laid for further advances. In particular, without aid, the poorest countries, where growth was slower, would have lagged more.” (Lewis, 1982, pp. 102-108).

In a similar line, White and Vos (1996) argue that aid has helped recipients in repaying debt burdens which could not be met from the recipients’ own resources, and without aid there would be no domestic resources for economic development, and reform would be difficult to sustain. This does not mean that aid ‘works’ on every count. As Browne (1990) explains, its effectiveness has mainly been positive in countries where there is a relatively egalitarian structure affording a relatively high labour participation and early investment in education and technical training measures. Aid has been hindered in countries when it was ill-matched by counterpart resources, low participation rates and inefficient public sectors. Although the impact of aid in each developing country is a special case, it can nevertheless be generalised to some degree. It is in this context that we have used a sample of developing countries and used both cross-section and panel data to generalise the effectiveness of aid.

## **9.2 Summary**

The case for giving foreign aid is an important issue which has received a lot of attention. Although this has been subject to a continuous debate, foreign aid has been constantly flowing to the developing world. Donors and recipients are optimistic that foreign aid can achieve some of its objectives. Even though the main objective of foreign aid is to promote economic development and welfare (in the long run) to alleviate poverty, in the immediate future, it is believed to relieve some bottlenecks inhibiting growth. It is often claimed that markets fail

to work in developing countries and additional investment, although it would have a high rate of return, would be constrained by low domestic savings rates thereby holding back growth. There is hence an emphasis on increasing capital as the way to raise incomes and the economic objective is to support investment and assist growth in developing countries. Apart from developmental objective which the donors also want the developing countries to benefit from, they have political and commercial objectives as well (which can undermine the beneficial impact of aid).

The volume of aid flows and other forms of capital transfers have an influence on aid effectiveness. As we discussed in Chapter 1, the trends of the net resource transfers have been unstable in the past four decades. The period 1973-81 witnessed massive capital flows largely in the form of private loans but a subsequent fall in these flows (between 1982-87) described the debt crisis period. Recovery in developed countries allowed resource transfers to surge. Due to capital market imperfections low income countries have relied heavily on foreign aid while private flows were more important for middle income countries. Although foreign aid has been relatively more stable than other flows, it has been rising at a slow rate. In per capita terms, South Asia, East Asia and the Pacific have received the lowest aid per capita due to the presence of the two most populated countries in each region. Even though Sub-Saharan Africa has received substantial amounts of aid in per capita terms, it is now countries in Europe and Central Asia that are claiming more aid per head. This is mainly because of the break up of the Soviet bloc since 1990.

Of all the forms of capital flows to developing countries, we focused our attention particularly on foreign aid to assess its relative impact. Not many studies have provided a clear analysis of the theoretical link between aid and growth. It is in this context that in Chapter 2 the motivation was to incorporate foreign aid in some growth models. These models will hence enable us to incorporate aid as a potential determinant of growth which can be tested



empirically using econometric techniques. We started with a simple Harrod-Domar model which is Keynesian in spirit, principally based on a fixed capital-output ratio. It was shown that an increase in aid will supplement domestic savings to increase the growth rate. Foreign aid, in this model, enables the economy to achieve higher growth as long as it is flowing in but growth will drop back to its previous level once aid stops. Solow (1970) challenged the constancy of the capital-output ratio to make it endogenous in the model so that in the long run the economy settles to a steady state. There are some important implications for foreign aid in the neo-classical model: first, when aid takes the form of capital goods (e.g. aid is tied to a project), the capital-labour ratio rises to enable a higher level of income per capita as long as aid is injected but will again shrink back to its original steady-state position when aid stops. Second, if aid is in the form of consumer goods, a higher income per capita than in the previous case can be enjoyed if an equivalent amount is disbursed (compared with the case where aid takes the form of capital goods). But in both cases aid's impact will only prove to be temporary once it is removed. Does this mean that aid's impact is short lived? Not necessarily so. Once some assumptions in the model are altered, a permanent effects can take place. For instance, in the Solow model, if the growth rate of population is a function of income per capita (see Crouch, 1973) and if aid is able to move the economy beyond the poverty trap level, permanently higher income per capita and growth can be achieved. We also developed a model to illustrate that aid can have permanent effects even when it is removed provided the recipient is able to assimilate some labour technology endowed when aid was flowing in. We further demonstrated, using the endogenous model, a case where labour in the recipient country can reasonably be assumed to have some unexplored form of knowledge which we treat as being 'dormant' knowledge due to the existing inferior technology level. Once aid is made available with a superior form of technology, the labour augmenting technology becomes 'active' and higher growth can be attained. When aid ceases to flow, it was shown that the growth rate is higher than the 'non-aid' rate but less than when aid was flowing in. In

such circumstances, aid is seen to have a long term beneficial impact. This is not to say that aid will always have this kind of impact. It will depend on many other factors such as the appropriateness of the imported technology. In fact there have been many instances where the recipients were faced with inappropriate technology transfer. These resulted in a wastage of resources (Duncan, 1986). In the case an 'appropriate' technology is made available to the recipient, the beneficial impact of aid will also depend on the capability of the recipient to adapt this technology. In fact, the adaptation of technology depends on how fast the developing country is able to 'catch-up' with the foreign technology. As Abramovitz (1986) argues, this will depend on the country's 'social capability'. This could be regarded as including factors such as years of schooling, commercial, industrial and financial institutions for instance. In a similar line, Dowrick and Gemmell (1991) found that to 'catch-up' developing countries should be above a certain 'structural poverty threshold'. Although there are many developing countries which are still below this threshold, it does not mean that aid should be not be directed to these countries. On the contrary, aid should help in building institutions and meet the requirements to move the economy above that threshold level. The growth models also encourage aid to be directed towards labour-intensive projects with appropriate technology. This can simultaneously target the poor to alleviate poverty.

Aid is not the only channel through which donors can help developing countries. Another way is through trading practices, for example, aid tied to trade, special prices and granting of special trade preferences. The last two cases are not strictly speaking classified as foreign aid. We depicted a case in Chapter 2 where tied aid, for instance, in the form of import support for intermediate goods, can improve the quality of the recipient country's product by making it more competitive on the world market. The donor in this case has, as it were, 'opened the door' for the recipient country to trade internationally. This will be beneficial if the price of the donor's tied-aid products are equal to

the world price. It has been argued that tied aid will not lead to any distortionary effect such as a real exchange appreciation since aid leaks abroad in the form of purchases from the donor. This implies that the money is spent in the donor country. However, the problem which is often confronted in practice is that the price charged to the recipient is in most cases higher than the world price. Empirically, it was found that this is often the case, for instance, Yeats (1990) found that many former colonies, in particular, paid a price premium of around 20-30 percent on their imports during the 1980s. In such a case, this will lead to a rise in the cost of production rendering the final product of the recipient country to be less competitive. Also tied aid might lead to an increase in the demand for nontradables, causing an increase in its price, which in turn results in a real exchange rate appreciation—the Dutch disease phenomenon. Hence tied aid, whether to capital or intermediate goods, can have distortionary effects on the recipient's economy.

So far it was assumed that aid supplements domestic savings to achieve economic growth. But it was also found that growth in large aid-recipient countries has not been high due other factors constraining growth, such as a lack of foreign exchange. The foreign exchange shortage view is sufficiently important in relation to analysing the role of aid to receive more consideration. Obtaining foreign exchange through foreign aid is often seen as superior to earning it through exports. This is because it requires scarce resources to produce the goods that are exported, while the receipt of aid does not. Also it is not easy for the developing countries to increase their exports as they are faced with exogenously low prices for their primary commodity exports. As explained in Chapter 3, aid will have a higher impact if it relieves a foreign exchange constraint than when savings is the relevant constraint. This is because when the foreign exchange gap is relieved, it brings redundant resources into use and hence increases the productive capacity of the economy. Nevertheless, the gap model has its critics as empirically it has been a poor predictor. Although the model optimistically assumed that the economic

structures of developing countries would change as a result of aid inflows, none of these were taking place. The assumptions on the which the model was based were also criticised. Also, Joshi (1970), Findlay (1973) and Luxton (1979) argued that a pure foreign exchange gap exists because of unstructured industrialisation, haphazard production ventures and poor sales and marketing strategies. They would all suggest that the relevant constraint on growth is savings and that increases in savings will enable an increase in growth. In this sense savings becomes crucial in having an impact on growth and the empirical growth models implicitly make such an assumption. More recently, there has been an increasing interest in a third gap where the traditional savings gap of the two gap model has been disaggregated—the fiscal gap. This is seen as a possible gap limiting the growth prospects of the highly-indebted group of countries (Bacha, 1990; Solimano, 1992; and Taylor, 1993). Although the fiscal gap is receiving some attention in the aid literature, we have preferred to concentrate on the savings gap and to leave the fiscal gap to be explored in future research work to analyse mainly the fiscal behaviour of developing countries' government.

In the aid-growth literature many investigators have regressed growth on domestic savings, foreign aid, private capital flows and other capital flows to test the relative effectiveness of foreign aid and other sources of capital. In Chapter 4, as a supplement to the trends analysed in Chapter 1, we investigated further the trends and composition of the capital flows to the six regions. This enabled us to infer which regions have been more favoured than others or which types of capital flows are more important. It was observed, for instance, that the bulk of private flows went to the Latin American and Caribbean region while foreign aid flows were more important to South Asia and Sub-Saharan Africa where the majority of poor countries are found. But with the breaking up of the Soviet bloc, foreign aid has become a major source of capital transfer for developing countries in Europe and Central Asia. Before establishing any link between capital transfers and growth, we also analysed the trends in growth

rates for the countries in these regions along with the savings and investment rates. We observed mainly that the growth performances of the countries in each region were adversely hit by the oil price shocks and the debt crisis, but recovered with the recent emphasis on trade liberalisation. Although the unfavourable shocks have caused some regions to experience lower growth and higher volatility in their growth rates, it was relatively higher in regions where the investment and savings rates were high. This descriptive exercise pointed out that these international events have been important in determining growth performance. These unfavourable events could have undermined the effectiveness of aid.

In relation to these, we then explained in Chapter 5 the relationship between aid and growth. As Mosley and Hudson (1995) explained, there is an 'expected sequence' where in the beginning the recipient receives low aid and experiences low growth. Even when high aid flows in, it experiences low growth but will eventually move at some time to a high growth position. But in the end donors expect that high growth will be sustained even with low aid inflows. This 'expected sequence' can only be achieved if there are no hiccups in the domestic and external economic position. Because the developing country cannot be isolated from the world economy, any major economic event (domestic or external) has some implications. We used a simple taxonomy to show how a recipient country's position can be affected by either a favourable or unfavourable external event. A very useful exercise which we have not been able to carry out, because of the amount of work involved, is to build a transition matrix for the sample of developing countries which we identified. This would have indicated the countries which have followed the 'expected sequence' of Mosley and Hudson and those countries which did not. This type of exercise will also enable us to point out the factors responsible for a country to display any particular pattern. Hence more information would be available to evaluate the effectiveness of foreign aid. Although there are many factors at the domestic level that can affect a country's position, we were not able to analyse

all of them statistically. Since we are interested in explaining how aid flows affect the growth performance, we took a sample of developing countries and analysed the association between aid, growth, savings and investment. The association between aid and growth is looked at from two angles. First, we analysed the associated aid inflows with particular levels of growth and second, the associated growth with particular level of aid inflows. In each case the respective savings and investment rates were computed. Although there were many instances where high aid was associated with high growth, there were cases where high growth is associated with low aid (but high investment rates). One obvious indication is that there is a strong association between aid and domestic savings, countries with high savings are associated with low foreign aid flows and vice-versa. Of course, even though a negative correlation exists, it does not imply any causation. We also divided the sample into low and middle income groups and similar deductions were made.

After the preliminary statistical exercise, a critical empirical review of the aid-growth literature was conducted in Chapter 6 to enable us to improve on specifying a suitable model for empirical testing and to apply appropriate econometric methodologies. It was noticed that early studies treated foreign aid and capital flows as synonymous even though their impact may be different for various reasons. Although it has been possible to disaggregate the various components of foreign inflows into foreign aid, private net flows and other capital flows, previous econometric models suffered from omitted variables and limited sample size. In fact due to limited time series data, cross-section analyses were more common. Concerning omitted variables, there are a host of factors which affect growth that were excluded in the aid-growth literature. Among the first to rectify this was Dowling and Hiemenz (1983) who introduced trade, fiscal and monetary variables along with the different sources of capital. Most models were criticised for not allowing for any lag structure. Another criticism of studies using single equations was that the ordinary least squares estimates would be biased if aid is endogenous. Although simultaneous

models were also used by some (though without any prior causality tests), the results at the macro level remained ambiguous. Nevertheless, aid has not been found empirically to be detrimental to growth.

Taking into account the shortcomings of previous studies, we specify in Chapter 7 a growth model for our estimation purposes. Most aid-growth investigations either pre-date or ignore many of the recent advances in growth theory which have allowed more sophisticated empirical growth equations to be specified. If aid is to be reliably identified as a growth determinant it is important, however, that it is included within a robustly specified empirical growth model. First, we attempt to remedy an important weakness of almost all previous studies: that of omitted variables. The taxonomy presented and the preliminary statistical exercise undertaken in Chapter 5 has indicated that domestic as well as external economic factors affect growth. On the domestic front, the importance of macroeconomic stability has been highlighted. Although it is claimed that macroeconomic stability is not necessary for sustainable growth, it is conducive to growth. This is one of the reasons that the World Bank has been lobbying for a supportive macroeconomic framework to achieve growth. By ignoring the impact of the macroeconomic environment, the beneficial impact of aid might have been masked in previous analyses. The main macroeconomic indicators that we have used are:

- (i) the standard deviation of the inflation rate—to measure the extent of inflation volatility. Effort to control the variability in the inflation rate indicates the ability of the government to manage the economy. An economy which is faced with high inflation volatility indicates that the government has lost its control.
- (ii) the budget surplus—this is also viewed as an indicator of a government that is able to exert some control. It has also been a major policy platform of the World Bank and the IMF. Reducing fiscal deficits have typically been at the core of successful stabilisation programmes.
- (iii) changes in terms of trade—this variable is included as a macroeconomic

indicator due to the fact that in the period of our study most developing countries have experienced major terms of trade shocks.

These indicators have been used in previous growth studies by Fischer (1993) and Easterly (1993). To model a robust growth model, we have also included some other variables which affect growth.

- a) a series of openness measures such as the crude openness measure defined as total trade as a percentage of GDP, a weighted openness measure to reflect both trade intensity and trade equilibrium, collected trade taxes as a percentage of total trade, and the black market exchange rate premium. Openness to trade raises growth through several channels such as access to advanced technology from abroad, possibility to catch-up, greater access to a variety of inputs for production, the scale of effects and externalities.
- b) a financial variable, measured by broad money as a percentage of GDP to reflect financial liberalisation. It is argued that financial liberalisation will foster growth and will increase the financial sector's ability to intermediate savings efficiently.

Our second attempt was to use a non-linear approach as proposed by Hadjimichael *et al.* (1995) to capture any potential distortionary effect of aid and allow for diminishing marginal returns, and third, we used both cross-section and panel data techniques.

The empirical investigation has been a very labour and data intensive exercise. We first estimated the model using cross-section analysis. The variables included were foreign aid, private capital flows, other capital flows, domestic savings, the macroeconomic variables and some trade and financial variables. The data for all the variables were averaged over the period 1970-93. The main result that emerged was that the effectiveness of foreign aid on growth is positive and significant, *ceteris paribus*. The other controlled variables were in line with their theoretical expectations (except the impact of private capital flows). The macroeconomic indicators support the view that growth will be higher where there is macroeconomic stability. Even when the foreign aid



variable was expressed in per capita terms, the positive contribution of aid was still observed. Also it was found that official concessional flows were more effective than nonconcessional flows. This is not too surprising when the latter are mostly provided on a bilateral basis and are primarily motivated by commercial and political motives.

The taxonomy in Chapter 5 indicated that any major international event can have serious repercussions on the developing country and affect the effectiveness of aid. In this context, we ran separate regressions for the time periods 1974-81, 1982-87 and 1988-93 to reflect the oil price shocks, the debt crisis and the trade liberalisation phases respectively. Foreign aid was found to be significantly positive in the 1988-93 period. The results indicate that the effectiveness of aid might have been overshadowed in earlier periods by unfavourable events.

We also divided the sample into various country groupings, for instance between low and high growth countries, low and middle income countries, and low and high aid receivers. It was found, in particular, that the effectiveness of aid was higher in high growth and middle income country groups. The use of cross-section data has some drawbacks. When averaging the data over the period of 1970-93, no account is being taken for the time dimension and the individuality of the entities being investigated. Data averaging over a long period does not give a clear picture of any relation between certain variables and may lead to misinterpretations, for instance concerning the coefficient of net private flows in tables 7.4 to 7.6. Also in table 5.3 countries like China, Korea, Mauritius and Turkey have been clustered in a group of countries which have received low private flows while it has been observed that these countries have experienced some significant increase in the volume and the ratio of private flows since the mid 1980s. This clearly depicts a case where cross section analysis can be misleading. Also the cross section model is not able to capture the major international developments that took place during the period

1970-93. It is mainly because of this that a panel framework is more appropriate. This in turn also enables us to take into account time and/or country effects (in the fixed effects model) and time and/or country heterogeneity (in the random effects model).

Using both, two-way fixed and random effects models, the effectiveness of aid is reconfirmed as being positive and significantly related to growth. We have preferred to use the latter technique for several reasons. First, there are gains in the degrees of freedom which leads to more efficient estimates. Second, it uses the feasible generalised least squares as compared to the ordinary least squares in the fixed effect model. Third, this technique enables us to account for the main international events that took place. Similar country groupings as in the cross-section analysis were used and it was found that aid is more effective in middle income countries and in countries which have received foreign aid amounting to more than 13% of their GDP. Overall, the results from both the cross-section and panel data analyses indicate that the effectiveness of foreign aid on growth is positive and significant.

Although we have managed to control for some important variables in our growth model, yet the model has its own limitations. It is well known that regressions of the kind that we have used indicate only correlation. In essence, we have established that there is a positive association between foreign aid and growth, but nothing can be said about any causal relationship between these two variables at this stage. For this, we need a sufficient number of observations to perform causality tests, for example Granger causality tests in a time series framework for individual countries or using the Dynamic Panel Data technique. Another limitation in our model is that we have not included any lag structure but we have used period averages to address this problem. Inclusion of lags will perhaps give better results if there are any lag effects. Concerning the estimation technique, we have used the ordinary least squares and the feasible generalised least squares on the assumption that foreign aid is

exogenous. However, our estimates will be biased if foreign aid is endogenous in the model. In such a case, instrumental variables or the two stage least squares would be more appropriate. Although individual country studies would bring more light concerning the effectiveness of foreign aid in each country, we were constrained by limited data to assume it, perhaps wrongly, to be the same for all the developing countries.

Critics of aid argue that aid displaces domestic savings and that it will lead to increases in consumption rather than investment. This has been the fungibility issue raised in the literature which is also important in assessing the effectiveness of aid. From the statistical exercise, it was found that a correlation exists between aid and domestic savings. Many studies have tested this relationship through regression analysis. Although the regression results typically imply correlation, nothing can be said about causality which aid-sceptics often refer to. In fact, only one study, that of Bowles (1987) undertook some Granger causality tests. The results were inconclusive and the techniques had many shortcomings. There are also many problems that have been identified in the aid-savings literature which are similar to those identified in the aid-growth literature. But more important is the way that the savings data are measured. They are computed as residuals which is questionable. Because of these problems, we test the aid-savings relationship indirectly in Chapter 8 by analysing the effect of aid on consumption.

Although Boone (1994) found that the marginal propensity to consume from aid is not significantly different from one by using a balanced growth model, we believe that the use of a well established framework for analysing consumer behaviour might be more appropriate to assess the impact of aid on consumption. Consumer theory was revolutionised both at the theoretical and empirical front by the combination of Modigliani and Brumberg's (1954) life-cycle hypothesis and Friedman's (1957) permanent income hypothesis. We use the framework put forward by Hall (1978), and refined subsequently by many

others, to test the impact of aid on consumption.

However the model is based on some restrictive assumptions, for instance it is assumed that the government is the representative consumer in the model. This is of some importance since most of the aid flows are received and managed by the government. It is assumed that the government is a utility maximiser and behaves as an individual consumer. Another assumption is that in some regressions we have modelled the residuals of aid from its trend as a measure of anticipated aid due to the problem of incorporating lagged aid in the model. Including lags in the model would require more advanced econometric software such as the Dynamic Panel Data and more observations to test for unit roots and time series properties. Although the use of the life-cycle/permanent income model can be informative about consumption (and saving) behaviour, there is another set of models which can be explored in the future that deals with the fiscal behaviour of government explicitly (for e.g. Heller, 1975; Mosley *et al.*, 1987; Gang and Khan, 1991; Khan and Hoshino, 1992; Pack and Pack, 1991 and 1993). These models assess the flypaper effect, fungibility of aid—whether foreign aid is used to reduce tax, the impact of aid on government consumption and investment and borrowing decisions.

Using the panel data technique, the feasible generalised least squares estimates led to the rejection of the life-cycle/permanent income hypothesis as found by previous studies. Interestingly, it was found that consumption growth in the pre-1980 period was significantly different from the post-1980 period. In this context, we used interaction terms on each of the explanatory variables to separate these periods. It was noticed that current consumption per capita is highly sensitive to expected changes in domestic income and foreign aid. While an increase in expected aid per capita appeared to have led to an increase in consumption per capita in the pre-1980 period, in the post-1980 period an increase in expected aid per capita in fact led to a fall in current consumption per capita. The latter could be the result of the first and second generation

conditionality imposed by the International Monetary Fund and World Bank, donors interest in managing and controlling aid funds, and recipients' lessons from past mistakes and awareness. It can also reflect cases where the donor imposes some fund-matching conditions whereby the recipient is forced to postpone its current consumption to meet the requirement. Overall, our results reject the life-cycle/permanent income hypothesis for domestic and foreign sources of income. Although aid was fungible in the pre-1980 period, effective policy dialogue and other factors in the post-1980 period appear not only to have contributed in reducing this fungibility but also to a fall in current consumption (i.e. domestic savings increased).

Since it was found that aid, in the later period, was in fact reducing consumption, we tested whether aid has any impact on investment. Most studies have reported a positive and significant impact of aid on investment. Based on a simple accelerator type model and using the same panel data technique, we found aid to have a positive significant impact on investment. But an important finding is that in the post-1980 period the effectiveness of aid on investment was reduced, although still positive. Such a decline in effectiveness can be associated with the side-effects of tied aid, too much aid-monitoring and possibly unsound conditionality and stabilisation policies which do not favour the recipient countries. In such a case an effective policy dialogue would be advisable to address the situation. Also, in the beginning of the post-1980 period many countries with huge debt burdens were using aid flows to repay their debts instead of investing these flows.

The analysis that we have undertaken concerning the impact of aid on growth, domestic savings and investments has some important policy implications for both the recipient and the donor. For the recipient, it has been shown that the role of macroeconomic policies is important. Aid's effectiveness will be higher in an environment where the macroeconomic framework is supportive. Hence there is a need not only to control for inflation and having a viable fiscal

deficit, but also to have a stable fiscal policy, competitive and predictable real exchange rate and a balance of payments which is perceived as viable. This implies implicit support for the motivations of adjustment programmes. Regardless of the soundness of an individual aid-financed project, growth is likely to remain slow when domestic policies discourage it. As for the donor, aid can have not only growth potentials, but also developmental effects if aid is directed towards labour-intensive projects. This in turn can alleviate poverty and improve the welfare of the poor. It has also been found that for aid to be effective, it should be above a certain threshold level (around 13% of GDP). Although aid is more effective in countries which are classified as middle-income, it does not mean that aid should not be directed to low-income countries. In fact, aid should be directed to countries where the infrastructural level is poor and where there is a need to reform institutions to improve the environment for investment and for the proper functioning of economic activities. To encourage the recipient to save foreign aid flows, the use of conditionality (as shown in Chapter 8) does increase the effectiveness of aid on savings. In fact, the first and second generation conditionalities have made recipients reduce their consumption levels in conjunction with increases in the level of foreign aid. Hence the structural adjustment programmes and stabilisation policies together with the political reforms undertaken by the World Bank and the IMF enable the recipient to use aid in an efficient manner. It would be advisable for policymakers in the donor countries to monitor aid flows with effective policy dialogue which suits the recipients. It is hoped that the analysis has been able to provide useful insights for some policy implications to both the recipients and the donors on foreign aid.

### **9.3 Suggestions for Future Research.**

Our empirical results suggests that aid effectiveness on growth, savings and investment is positive. It is hoped that the theoretical and empirical

assessments carried out in this thesis have addressed some of the many issues in supplying evidence about the effectiveness of aid. On the theoretical front, using conventional growth models we were able to incorporate foreign aid and traced out its potential impact. While on the empirical front we have managed to tackle many flaws in the existing literature. This study is by no means complete, much work in determining the developmental effectiveness of aid needs to be carried out. Since we were not able to investigate all the facets of economic development, we would like to make some recommendations for future work.

First, due to limited time series data we did not carry out any causality tests among the variables of interest. Although we could have used one or two lags, we have preferred to leave this exercise to when single country cases are investigated. In such cases, the lag structure can be determined by the data generating process itself rather than arbitrarily imposing some lag structure, since the lag structure need not be the same for all countries. Second, even though we have generalised the effectiveness of aid for the developing countries, it would be interesting to take individual country cases to see the extent to which it 'works' in different countries. Third, but closely related to the second, is to take a number of countries which have received similar amounts of foreign aid in each region, having more or less the similar economic backgrounds, and to compare aid's effectiveness. It will be helpful to build a transition matrix and observe the countries as they move from one state to the other. This will shed more light on which other factors and policies are necessary for aid to be effective. Fourth, as mentioned above, the very purpose of aid is to promote economic development and in this study we have not addressed issues related to poverty alleviation or income inequality. These could be carried out on a country level basis in the future. This will enable us to see whether aid is reaching the very poor. Due to limited data we have treated aid as a 'bundle', it would be interesting to analyse the impact of project versus programme aid, food aid versus capital aid, or aid in a particular sector when

data are available.

It must be noted, however, that we have tried to assess aid's effectiveness from the recipients' point of view and have ignored donors. Aid effectiveness is evaluated from what the recipients have received. But have they received the 'right' amount or type? For this, one must consider donors performance in allocating aid. Some work has been covered in this area but more still needs to be done. Nevertheless, it is hoped that this thesis will contribute to the aid literature and that future empirical work will adopt the model (or a variant of the model) that is being advanced and some of the techniques that have been discussed. It is also hoped that the analysis will help in understanding better the effectiveness of foreign aid.



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